SCIENCE

EDITORIAL COMMITTEE: S. NEWCOMB, Mathematics; R. S. WOODWARD, Mechanics; E. C. PICKERING, Astronomy; T. C. MENDENHALL, Physics; R. H. THURSTON, Engineering; IRA REMSEN, Chemistry; J. LE CONTE, Geology; W. M. DAVIS, Physiography; O. C. MARSH, Paleontology; W. K. BROOKS, C. HART MERRIAM, Zoology; S. H. SCUDDER, Entomology; N. L. BRITTON, Botany; HENRY F. OSBORN, General Biology; H. P. BOWDITCH, Physiology; J. S. BILLINGS, Hygiene; J. MCKEEN CATTELL, Psychology; DANIEL G. BRINTON, J. W. POWELL, Anthropology.

FRIDAY, JANUARY 8, 1897.

CONTENTS:

The Smithsonian Institution and the National Museum..... 37

The Geology of Government Explorations (concluded): S. F. EMMONS..... 42

Professor Eugen Baumann: LAFAYETTE B. MENDEL..... 51

Alfred Tresca: R. H. T. 53

Current Notes on Anthropology:—

Ancient Mayan History; Primitive Drills and Drilling; The Slate and its Soil: D. G. BRINTON.. 53

Scientific Notes and News:—

The Davy-Faraday Research Laboratory; The Marine Biology of Great Britain; General..... 54

University and Educational News..... 59

Discussion and Correspondence:—

Clouds over a Fire: R. DEC. WARD. *Compliment or Plagiarism*: BEMAN AND SMITH. *Volcanic Dust in Southwestern Nebraska and in South Dakota*: J. E. TODD..... 60

Scientific Literature:—

Beal's Grasses of North America: F. LAMSON-SCRIBNER. *Hoffmann on Race Traits and Tendencies of the American Negro*: W J MCGEE. *De Ujfalvy on Les Aryens au Nord et au Sud de l'Hindou-Kouch*: D. G. BRINTON..... 62

Scientific Journals:—

The Monist..... 69

Societies and Academies:—

The New York Academy of Sciences:—*Section of Astronomy and Physics*: W. HALLOCK. *Section of Biology*: C. L. BRISTOL. *The American Chemical Society*: DURAND WOODMAN. *Boston Society of Natural History*: SAMUEL HENSHAW. *The Alabama Industrial and Scientific Society*: EUGENE A. SMITH..... 70

New Books..... 72

MSS. intended for publication and books, etc., intended for review should be sent to the responsible editor, Prof. J. McKeen Cattell, Garrison-on-Hudson, N. Y.

THE SMITHSONIAN INSTITUTION AND THE NATIONAL MUSEUM.

THE great loss to science in the death of George Brown Goode is becoming every day more apparent and especially in view of the difficulties by which the Regents of of the Smithsonian Institution must find themselves confronted in the selection of his successor as Assistant Secretary.

Under the existing relations of the Institution and the National Museum, and the accepted traditions relating to succession, the task must seem well-nigh impossible. While the present situation may not be considered as a crisis in the affairs of the Smithsonian Institution, it cannot be improper for SCIENCE to invite the attention of its readers, and especially of the Regents, to a feeling on the part of a large number of its friends that the time has come for a more or less complete separation of the two organizations and that such separation in the near future ought to be assumed in selecting a successor to Goode.

The reasons for this are so numerous and so convincing, when once the Smithson bequest and its interpretation by Joseph Henry are considered, that argument seems unnecessary. It may be well, however, to refer to a few of the more important points,

and especially to show that the existing condition was not approved by those who guided the Institution through the dangers by which it was beset during its earlier years and to whom we are indebted, more than to all others, for the splendid work which it has accomplished during the first half century of its existence.

The origin of the Smithsonian Institution was singular, its organization is unique and its success has been unparalleled. In 1796 Washington recommended as of primary importance the promotion of '*institutions for the increase and diffusion of knowledge.*' In 1826 James Smithson, an Englishman about whom America knew nothing and who knew practically nothing of America, wrote in his will: "I bequeath the whole of my property to the United States of America, to found at Washington an establishment for '*the increase and diffusion of knowledge among men.*'" In 1846 John Quincy Adams wrote: "Let the trust of James Smithson to the United States of America be faithfully executed by their Representatives in Congress; let this result accomplish his object—*the increase and diffusion of knowledge among men.*"

As soon as the funds resulting from the bequest of Smithson were in the treasury of the United States a multitude of plans were suggested for the realization of the intention of the donor. Some were reasonable, many were unreasonable, and it is now universally conceded that the scheme of organization proposed by Joseph Henry and adopted by the Board of Regents was the best that could have been selected. The essence of that scheme is most clearly exhibited in the words of Prof. Asa Gray, who wrote: "Henry took his stand on the broad and ample terms of the bequest, 'for the increase and diffusion of knowledge among men,' and he never narrowed his mind and to *locality* gave what was meant for mankind. He proposed only one restriction, of wisdom and necessity, that in view of the limited means of the institution, it ought not to undertake anything which could be done, and well done, by other existing instrumentalities. So, as occasion arose, he lightened its load and saved its energies by giving over to other energies some of its cherished work." It is through this policy that the Institution has enjoyed a career of usefulness unequalled by that of any similar organization, and in Prof. Gray's words will be found the strongest arguments against a continuation of its existing relations to the National Museum. By the terms of Smithson's will the Institution is charged with two functions: The *increase* of knowledge, and its *diffusion* among men. To both of these should be applied the principle of restriction so wisely adopted by its first Secretary, that it ought not to undertake anything that could be done, and well done, by existing instrumentalities. It has, therefore, under each of its distinguished directors, increased knowledge by aiding original investigators who were otherwise unable to carry on their researches, and it has diffused knowledge among men by publishing many important memoirs, translations, summaries, etc., which would hardly have been made available without such assistance. Its extensive system of international exchanges has been in the same line, and in all this its position has been unique.

In the earlier years of the Institution its collections were such as related purely to research and were made in the course of various original investigations to which it was giving aid. These naturally increased in number and covered an increasingly large field, though mostly pertaining to the biological sciences. Although no special effort was made to arrange them for public display, they constituted an interesting collection, and a visit to the 'Smithsonian' was accounted an essential incident in a pilgrimage to the Nation's capital. It then came to be considered as in some sense a 'museum.' What is known as the 'National Museum' was established by the Government in 1842, being made up largely of specimens collected by the Wilkes expedition. It was housed in the Patent Office, but in 1858 it was transfered to the Smithsonian Institution, being largely increased at that time by additions from other government departments. Its acceptance then by the Institution was undoubtedly in furtherance of the idea that it ought to undertake what evidently could not have been accomplished by any other organization, namely, the consolidation of the numerous collections that had separately grown up in the several departments. That it was not expected that the Institution should permanently load itself with museum management is clear from the attitude of its authorities twenty years ago. In his Report to the Regents for the year 1876, Prof. Henry puts the whole matter so clearly that his words may well be quoted in part. He says: "I may further be allowed to remark that the experience of the last year has strengthened my opinion as to the propriety of a separation of the Institution from the National Museum. * * * Smithson gave *his own* name to the establishment which he founded, thereby indicating that he intended it as a monument to his memory, and, in strict regard to this item of his will, the endowment of his bequest should be administered *separate from all other funds, and the results achieved by it* should be *accredited to his name alone*. The Institution should not, therefore, be merged in an establishment of the government, but should stand alone, free to the unobstructed observation of the whole world, and keep in perpetual remembrance the name of its generous founder. * * * Every civilized government of the world has its museum, which it supports with a liberality commensurate with its intelligence and financial ability, while there is but *one Smithsonian Institution*—that is, an establishment having expressly for its object 'the increase and diffusion of knowledge among men.' The conception of such an institution—not a local establishment intended to improve the intellectual condition of any single city or any single nation, but that of mankind in general—was worthy of the mind of Smithson, and the intelligence and integrity of the United States are both involved in the proper administration of the trust, since the terms in which it was conveyed must be truly interpreted and the intention expressed rigidly carried out." Prof. Henry continues in reply to the assumption sometimes made that the Institution was benefited by increased popularity due to its connection with the Museum, declaring that, on the contrary, this connection has proved a serious obstacle in the

way of the full development of the plan of the Institution, and naming as the most objectionable result the necessity for constant appeals to Congress for appropriations, which would be quite unnecessary if its energies were confined to their legitimate channels.

In his Report for 1887 Prof. Henry said: "In the preceding reports I have called the attention of the Board of Regents to the propriety of a final separation of the Institution from the National Museum, and nothing has occurred during the past year to change my opinion on this point. * * * The functions of the Institution and the Museum are entirely different."

In a report of a special committee submitted in 1887 by Prof. Asa Gray, then a Regent of the Institution, the question is seriously considered and the dangers by which the Smithsonian Institution is menaced through its relations to the National Museum are set forth, in part, as follows:

"We are therefore bound to conclude that the Board of Regents, as respects these National collections, acts as the trustee of Congress. Under this state of things, and in view of the ever-increasing magnitude and interest of these collections, the relation of this Institution to the National Museum becomes a matter for grave consideration. * * *

"Our Secretary, in his annual report submitted on the 26th of January, 1876, has now raised the grave question whether the well-being of the Institution would not favor or even require the adoption of a similar policy as regards the National Museum. He declares that it is most 'desirable that a more definite distinction between the two establishments, if not an entire separation, should be made,' and he urges the subject upon our attention by considerations which cannot be disregarded. Your committee was appointed to take thought upon this subject. The vast increase of museum objects in natural history, ethnology, and materials of industrial art, consequent upon the Centennial Exposition, an increase far beyond the largest anticipations, gives new importance and urgency to this question. * * * Now the proportion which the Museum bears to the Institution proper is already large, and it threatens to be predominant. We have no desire to check its immense development, and we contemplate with satisfaction its sure popularity; but as respects the burden which the Museum throws upon our Secretary, we may say that it is already heavy, and that it threatens to be injuriously large. If not provided against, the time seems sure to come when the Museum will mainly absorb the working energies of the Institution. * * *

"No present action is proposed by this committee beyond the recommendation that the distinction between the Institution itself and the Museum under its charge should be made as prominent as possible. The very great development which the Museum is now undergoing may soon bring the whole subject before the board in a practical form * * * if the Museum is to develop to its full size and importance upon the present site, according to the plans laid before the board, and by it recommended to Congress this will, as it seems to us, almost necessarily involve the acquisition by the government of our present edifice, and that will pave the way for an entire separation of administration, or to such other adjustment as the Board of Regents may then think best, or be able to accomplish." [Signed]

Asa Gray,
A. A. Sargent,
Hiester Clymer,
Committee.

Although Prof. Baird was naturally more interested than his predecessor in the development of the Museum, of which he was, indeed, for many years Curator, his recognition of its independence of any real relation to the Institution was shown in his first report to the Regents, being that for the year 1878. He says: "The relations existing between the Smithsonian Institution and the National Museum have been so frequently referred to by my predecessor that it is only necessary to mention briefly

that the Museum constitutes no organic part of the Institution, and that, whenever Congress so directs, it may be transferred to any designated supervision without affecting the general plans and operations connected with the 'increase and diffusion of knowledge among men.'"

There is another and most serious objection to the present organization which is, in a degree, personal in its nature. There is an approved tradition that the Assistant Secretary shall, on the occurrence of a vacancy, succeed to the Secretaryship, and the latter should, in the best interests of science, be held alternately by representatives of the two great divisions of science, physical and biological. It will almost invariably happen that the naturalist only will have any special taste or fitness for museum work, and upon him, then, both as Assistant Secretary and Secretary, this burden will fall. If he is chosen for his experience and skill as a museum director, he may fail as a Secretary of the Institution if he should in time succeed to this high office, for we may not expect to find many such men as Goode, who, in a remarkable degree, combined the qualities necessary to a successful administration of both functions. On the other hand, one selected with a view to his eventually being a worthy successor to the distinguished men who have thus far guided the destinies of the Institution may not be a good museum administrator.

Finally, the whole may be put in two or three simple propositions. There is no logical connection between the Smithsonian Institution and the National Museum. The Museum is a most important institution, it is now well established, its maintainance is demanded by the people, and it will thrive under a competent director, responsible only to Congress or to the head of some department under which it could properly be placed. The usefulness of the Smithsonian Institution will be increased by the diminution of burdensome administrative duties which were never contemplated in its original scheme, and for the existence of which there can be no reasonable excuse. Its legitimate work is too important to be interfered with by demands which can be met in ordinary channels, and if such wide departures from its early policy continue to be forced upon it by ill-considered legislation, there is reason to fear that its splendid career during its first half century will not be repeated in the second.

In conclusion it ought to be said that in the above it is not intended to reflect the views of the present distinguished head of the Institution or of any of its officers. We are quite ignorant as to what these views may be, nor do we wish to be understood as criticising, in the slightest degree, the present admirable administration of the Institution or of the Museum. There are doubtless valid arguments, such as the danger that the Museum might fall among politicians, which could be urged for the continuation of the present arrangement. Still we believe that, for the reasons recorded, the interests of both institutions and the interest of science throughout the world would be furthered by a separation of the two organizations. If the regents are strongly of the opinion that the danger of political intermeddling is too great to justify a complete severance of existing relations at this time,

it is at least possible to select an Assistant Secretary in accordance with the theory outlined above, and a Director of the Museum possessed of special qualifications for that work, and who shall, of course, be subordinate to the Secretary of the Institution. This might lead the way to what is certainly still more to be desired.

---

*THE GEOLOGY OF GOVERNMENT EXPLORATIONS.**

GEOLOGICAL EXPLORATION.

During the Civil War all scientific exploration in the West under the auspices of the government was suspended, and it was not until the summer of 1867 that it was resumed. By this time far-sighted men had come to appreciate the political importance of a more exact geological knowledge of the region between the Mississippi Valley and the Sierra Nevada. During the war there had been no little danger that the States of the Pacific slope might secede from the Union and form a republic of their own, isolated as they were from the other States by a barrier of 1,000 to 1,500 miles of comparatively uninhabited mountains and desert valleys. The lending of government aid to the building of a trans-continental railroad, which had already been decided on, was the first step toward removing this barrier and drawing the peoples of the East and the West into closer connection. The second step was to encourage the settlement of this intermediate region by making known to the public its rich and varied mineral resources. Hence, Congress showed itself ready to lend an ear to geologists who were desirous of getting government aid to carry on geological researches in the comparatively unknown region beyond the mountains.

Now, for the first time, explorations beyond the Missouri river, or surveys, as they soon came to be called, were fitted out avowedly for the purpose of geological investigation, instead of being primarily organized for geographic or military purposes and admitting researches into geologic and other branches of natural history as a sort of ornamental appendage of their work. For the first time also were they under civilian control instead of military discipline and command. During the twelve years previous to the organization of the present Geological Survey the principal geological work in the West was done under four district organizations, popularly known from the names of their leaders as as the King, Hayden, Powell and Wheeler Surveys. The official control of the first and last was under the Chief of Engineers of the United States army, but only the last was commanded in the field by military officers. The other two were under the Interior Department and their official titles changed somewhat with the development of their work.

During this period geologists were also attached from time to time to military reconnaissances, but with one exception—that of Newton and Jenny in the Black Hills, where the geological information had a political bearing—the march was so rapid that the opportunities of geological research were very limited, and the results of relatively little importance. Therefore, in view of the limited time at my disposal, I shall confine myself mainly to the principal surveys above mentioned.

Before commencing an account of their methods and work accomplished it will be well to pass in review the condition of geological knowledge of the country west of the Mississippi Valley at the commencement of this period in 1867.

No areal work, in the sense in which it is understood to-day, had been commenced or hardly thought of. The only maps that

* Concluded from the issue of January 1st.

existed were those giving the general features of the larger drainage systems on which was no connected or systematic representation of the surface features; in certain limited areas the relief was sketched in by hachures, or, as in Egglofstein's maps, by delicate shading.

On the Great Plains it was known that Mesozoic and Tertiary formations formed the greater part of the surface, and the Cretaceous rocks had been divided by Meek and Hayden into five subdivisions. Around the Black Hills, Lower Silurian and Carboniferous rocks had been identified. Carboniferous limestones were known to have a considerable extension in the interior region in middle and southern latitudes, and to have been seen in the northern part of the Sierra Nevada. The age of the upheaval of the latter range had been determined to be post-Jurassic, by the discovery by Clarence King, of the State Geological Survey of California, of Jurassic fossils in the auriferous slates. It was conjectured, reasoning from their association in the Black Hills, that Silurian beds would ultimately be found associated with the Carboniferous, but the discovery of Devonian fossils in central Nevada by Engelmann in 1859 had not yet been made public. It was known in a general way that igneous rocks, granites and metamorphic rocks were widely distributed throughout the interior, but of their mutual relations, or the actual structure of the mountain ranges, there was little but surmise, and not very much of that.

As regards the physical conditions of the interior, although the region east of Salt Lake was known to be well watered, in the desert region of the Great Basin to the westward, it was not supposed that campaigning was possible, except along certain lines of emigrant travel, and on these it was known that there were inconveniently long stretches without water.

King Survey. The Geological Exploration of the 40th Parallel, as it was officially known, was entirely the creation of its chief, Clarence King. The first conception of the feasibility of making a geological cross section of this, the longest mountain system in the world, at its widest part, had come to him during his long three months' journey with an emigrant train from Missouri to the Sierra Nevada, which he undertook in the summer of 1861. His personal influence had, during the winter of 1866–7, secured the passage of a bill through Congress creating the 40th Parallel Survey, whose duty it was to examine into and report upon the geology and mineral resources of the country to be opened up by the Pacific railroads. At his suggestion it was placed under the official direction of Gen. A. A. Humphreys, Chief of Engineers, in whose scientific ability he had the greatest confidence.

His plan of work contained much that was novel and startling, especially in consideration of the desert character of the region in which it was to be carried out. This plan contemplated making a topographical map of the region surveyed, not simply a map of meander lines, with sketches in hachures of the hillsides, which was the only form of relief map known at that time, but a contour map on the same general plan with the Survey maps of the present day, controlled by systems of primary and secondary triangulations, the relative elevations to be determined by frequent observations of cistern barometers. The scale adopted was four miles to the inch. Besides the usual botanical and zoological assistants, an excellent photographer was attached to the party. The area to be surveyed, which was always to include the line of the projected railroad, was divided into rectangular blocks or atlas sheets, about 165 miles in length by over 100 miles in width. The original plan contemplated

three, but ultimately five of such blocks were surveyed.

The party rendezvoused in California in the early part of the summer of 1867, and commenced work at the east base of the Sierra Nevada in August of that year, with J. D. Hague, Arnold Hague and S. F. Emmons as geological assistants to Mr. King. The following winter was spent in Virginia City in a study of the Comstock lode, where the mines, then about 1,000 feet deep, had already produced 100 millions of dollars. In the following year the work had become more systematized, and, by parcelling it out in several parties each consisting of a geologist and topographer, by the close of an unusually long season it had been carried entirely across the Great Basin to the western shore of Great Salt Lake. In 1869 the remaining desert ranges of Utah, the great Wasatch Range and the western end of the Uinta Mountains were surveyed. This completed the work of the Survey as originally planned, and the party was then located at New Haven for the purposes of working up their large collections of rocks and fossils and platting their notes both geologic and topographic.

Mr. James D. Hague had detached himself from the field parties in 1868 to make a special study of the mining districts, and the result of his work, with some contributions from other members of the party, was published in 1870 as Vol. III. of the Survey reports, entitled 'Mining Industry.' The most important part of this volume is the elaborate study of the great Comstock lode, which has served as a model for all subsequent monographic studies of mining districts in this country, the only country in which such work has been done. In Chapter VII. of this volume, on the Green River coal basin, Mr. King defined the stratigraphical position of the coal-bearing rocks as undoubtedly Cretaceous, and gave a brief preliminary sketch of the general geological column as developed in the Wasatch Mountains, which he estimated as 56,000 feet in thickness below the Cretaceous.

Stratigraphical work in Nevada and Utah among the isolated mountain ranges, subsequently designated by Gilbert as the Basin Range system, was exceptionally difficult because these ranges were separated from each other by valleys 10 to 15 miles in width covered with an unknown depth of Quaternary detritus. Thus no stratigraphical sequence of rocks could be carried from one range to the other, and until the Wasatch Range was reached there was practically no starting point for the geological column, for most of the fossils collected were of new species, and their horizons could only be finally determined after a long comparative study.

Work at New Haven was abruptly interrupted in midsummer of 1870 by telegraphic orders from Gen. Humphreys to take the field at once, as Congress, without solicitation from any one, had passed the usual appropriation to continue the field work. As it was then too late to get together the necessary outfit for a campaign in the high mountain regions to the east of the Wasatch, the work of that season was devoted to a study of the extinct volcanoes of the Pacific Coast, which were apportioned, Mt. Shasta to Mr. King, Mt. Hood to Mr. Arnold Hague, and Mt. Rainier to myself. This work was interrupted by the winter snows, and, as Gen. Humphreys decided that the connection of these mountains with the 40th parallel was too remote to admit of its being taken up again, the only immediate fruit of the summer's geological campaign was a paper in the *American Journal of Science* (June, 1871), announcing the discovery of active glaciers on their slopes, the first then known within the boundaries of the United States.

In the summers of 1871 and 1872 the

work of the survey was carried eastward to the Great Plains, taking in the great Eocene beds of the Green River basin; the Uinta Range, unique on account of its east and west trend and its anticlinal structure; the Elkhead Mountains with their remarkable development of rare varieties of igneous rocks; the inclosed Mesozoic and Tertiary valleys of the North Park and the Laramie Plains; the Medicine Bow Range, with its series of Algonkian rocks, then classed as Huronian; and finally the northern extension of the Front or Colorado Range, with its granite core flanked by upturned Paleozoic rocks, which had thinned from 30,000 feet in the Wasatch section to less than 2,000 feet, and were only visible at a few points, being overlapped by Mesozoic or Tertiary beds, as the case might be.

The thorough study and discussion of the material gathered during these years of field exploration necessarily occupied much time, but the then-existing conditions protracted the work much more than would be the case at the present day. The topographical base of the five large atlas sheets was not completed until 1874. In the summer of that year a member of the Survey visited Europe and conferred with the directors of the leading Geological Surveys there on methods of treatment and of publication.

Microscopical petrography was then an unknown science in this country, and one result of this visit was that Prof. Ferd. Zirkel, of Leipzig, then the highest authority in this branch of geology, was induced to visit this country to examine the collections of igneous and crystalline rocks and take notes on their field habits. Chips for making thin sections were taken back by him on his return to Germany for systematic microscopical study, and his report (Vol. VI.) published in 1876 was the first work of this kind on American rocks.

The final determination of the fossils collected was confided to F. B. Meek, James Hall and R. P. Whitfield, at that time the only paleontologists competent to undertake so important a work, but they could only devote to this task moments of leisure from other and to them more pressing work, consequently it was nearly four years after the completion of field work before the geological material was finally ready for publication. The volume on Descriptive Geology by A. Hague and S. F. Emmons with the final sheets of the geological atlas went to press in 1876, and in the following year was written Mr. King's masterly summary of the whole work, designated 'Systematic Geology,' which discussed not only the general history and structure of the Cordilleran system, but also such subjects of general theoretical interest as the 'Genesis of granite and crystalline schists,' the 'fusion, genesis and classification of volcanic rocks,' etc.

The distinguishing character of this Survey, as compared with the other organizations, was that its work was founded on a complete and comprehensive plan adopted before taking the field, which in all its essential features was systematically followed out during the ten years of its existence.

Hayden Survey. The names of Hayden and Meek had long been identified with the geology of the Missouri Valley and the Great Plains, and when it was found in 1867 that of the appropriation for legislative expenses of the Territory of Nebraska there remained an unexpected balance of $5,000 it was very wisely given to Dr. Hayden to expend in geological researches in that territory. From this modest beginning grew, by a process of gradual evolution, what became finally known as the United States Geological and Geographical Survey of the Territories, the catalogue of whose reports constitutes a pamphlet of fifty pages. F. B. Meek and Dr. C. A. White assisted Dr. Hayden during the first

two years. In 1869 James Stevenson was appointed executive officer, a position which he continued to fill with credit until the end. In this year Persifor Frazer, jr., was attached to the party as mining geologist, and the line of geological travel, for such was the character of their work during the early years, led along the foothills of the Rocky Mountains from Cheyenne to Santa Fé. In 1870 it ran westward from Cheyenne through the South Pass to Fort Bridger, and back along the north slope of the Uinta Mountains.

In 1871, for the first time, two topographical assistants were attached to the party, and Dr. A. C. Peale made his first field season as mineralogist. The line of travel this year led from Ogden, Utah, via. Fort Hall, Idaho, to Fort Ellis (Bozeman), Montana. From there an excursion was made into the geyser region of the Upper Yellowstone, and the enthusiasm aroused by the view of these wonders of nature, and the representations of Dr. Hayden on his return, induced Congress to set the region apart as a National Park.

In 1872 the force was greatly augmented, the names of Holmes as artist and Gannett as astronomer first appeared upon the rolls of the Survey, and F. H. Bradley did a season's work as geologist and paleontologist. Work was conducted in two parties in the same general region that was visited in the previous year.

In the spring of 1873 James T. Gardner, who had been chief topographer of the 40th Parallel Exploration, was engaged as chief geographer, and the areal survey of Colorado was commenced. Work was carried on in three or more parties, each in charge of a geologist or of a topographer, as the case might be; but, as on the 40th Parallel Survey, geologist and topographer worked side by side, and the one had to suit his work to the exigencies of that of the other. This system had certain disadvantages, and on the 40th parallel it was sometimes found necessary to go back to study key points. Such a trip was made by Mr. King and the speaker to the Wasatch Mountains in 1873.

A. D. Wilson, who had also been topographer on the King Survey, joined the Hayden Survey in 1874. The areal survey of Colorado under the Hayden Survey was continued for four years, and finally completed in 1876.

Among the geologists, Marvine, who early showed great ability, had charge of the northern division for two seasons, but died before he had written up his second season's work. Dr. F. M. Endlich, who had studied in Germany, where he served on the Geological Survey of Baden, joined the Hayden Survey in 1874, and continued to the end in 1878. In Colorado he worked mostly in the southern part of the area mapped, as he was supposed to have a better knowledge of igneous rocks than the others, but in later years the practical test of his work by other geologists in the field has proved it to be less reliable than that of any of the other geologists.

Dr. A. C. Peale worked mostly in the central part of the State, and as he gained in experience proved himself a careful and intelligent worker. The genius of the party was W. H. Holmes, who, starting as an artist without previous geological training, gradually developed, as a result of his study of nature, a remarkable aptitude for structural geology. His drawings of mountains have never been equalled by any other artist in their combination of fidelity to nature, with artistic effect and keen insight into geological structure. The paleontologists, C. A. White, F. B. Meek, E. D. Cope and Leo Lesquereux, contributed in their special lines to the work in Colorado, the first also doing considerable field work. Other specialists were attached to the parties at different times, and the sons of many promi-

nent men in the East were temporarily attached to the various parties. W. H. Jackson, the eminent photographer, was also a member of the Survey.

Dr. Hayden's plan was to make the Survey as widely popular as possible, and one method of accomplishing this result was to publish a volume every year, abounding in excellent illustrations from the pen of Holmes, which were gratuitiously distributed in very large numbers. One consequence of this method was that the geologists did not have time to thoroughly digest their material, or correlate and compare it one with another. It is much to be regretted that in consequence no summary like the 'Systematic Geology' of King has ever been written of the Hayden work. The beautifully colored maps in the atlas of Colorado, which were compiled and drawn by Holmes, answer in one sense as such a summary, for they indicate graphically many general conclusions that are not to be found in the annual reports. The latter, on the other hand, often have a different system of geographical nomenclature from that given on the map, which renders them sometimes almost unintelligible.

The Colorado areal work joined that of the 40th parallel on the south. In the years 1877 and 1878 the areal work was transferred to Wyoming and carried northward from the northern limit of the 40th parellel maps northward to the Yellowstone Park. On this work St. John served one season in the Wind River country and in 1878 Holmes and Peale made an extensive study of the phenomena of the Yellowstone Park. Even photography has not accomplished, in all the time that has elapsed since, any improvement on the admirable illustrations drawn by Holmes of the geological wonders of this region.

Powell Survey. In the summer of 1869 Maj. J. W. Powell made, under the auspices of the Smithsonian, his famous boat exploration of the mysterious depths of the canyons of the Colorado River, starting from Green River City, on the Union Pacific Railroad, in May, and emerging from the mouth of the dark canyon nearly 900 miles below, three months later, a journey that is unequalled for its courage and daring in the annals of geographical exploration.

Already in the two preceding summers he had visited the valleys of many of the streams tributary to the Green River, and during 1870 and 1871 his explorations of the canyons were continued, still under the same auspices. With the narrative report of these explorations, published in 1875, appeared an admirable discussion of erosion and land sculpture in its relation to geological structure, defining for the first time *base-levels of erosion*. This, with the similar discussions of Gilbert, based on his studies of the Colorado Plateau region in 1871–2, have formed the starting point of modern physical geography.

In no part of the world can there be found so admirable a region to study the elementary processes of stratigraphical geology as in that traversed by Powell's exploration. It is, so to speak, nature's text book of geology, whose pages lie open to the inspection of any one who possesses the physical courage and endurance to reach the depths of its canyons. Hence, Powell's geographical exploration was at the same time a valuable contribution to geology, in that it opened the road to so important a field that had hitherto been supposed to be inaccessible except to the birds of the air.

The Powell organization soon became a geological exploration, receiving its appropriations directly from Congress, and assuming the title of Second Division of the United States Geological and Geographical Survey of the Territories. It did not attempt to make an areal survey of this interesting region, but devoted itself to monographic studies of some of the most novel

and striking features of its geology. In 1873 and '74 Powell himself, assisted by Dr. C. A. White, extended the geological observations made along the banks of the upper Green River into the surrounding country, and in 1876 published his report upon the geology of the eastern Uinta Mountains.

Under this organization also Mr. Gilbert made, in the summer of 1775, his classic study of the Henry Mountains, the most prominent among the laccolitic groups that project above the Colorado Plateau, and introduced for the first time the term *laccolite* into geological literature. This effectually refuted Scrope's dictum, which at one time was almost an axiom among Europe geologists, that igneous eruptions do not exert any elevatory force upon the surrounding sedimentary beds through which they have been extruded.

The final work of the Powell Survey was the study, in 1875-6 and 7, of the High plateaus of Utah by Captain C. E. Dutton, an officer of the Ordinance Corps of the United States, on detached duty; he also made the petrographical examination of the igneous rocks brought in by Gilbert from the Henry Mountains. To this report, which was published in 1880, there was appended a prefatory note by Major Powell, giving a general sketch of the orographic movements recorded by him during his investigations in the Plateau region.

Wheeler Survey. I have reserved my mention of the work of the Wheeler Survey to the last, although chronologically its geological work antedates much that has already been mentioned, for the reason that as an organization, as indicated by its title (United States Geographical Surveys West of the 100th Meridian), it did not recognize geology as an essential part of its work.

The Wheeler Survey was indirectly an outcome of the 40th Parellel. When two seasons' campaigning of the latter organization had proved the practical feasibility of conducting such work in the Western mountains, Lieutenant G. M. Wheeler, of the United States Engineers, secured the consent of his chief to undertake, in the summer of 1869, a military reconnaissance for topographical purposes in southwest Nevada and western Utah. Although no geologist was attached to this first expedition, visits were made to various mining districts, but the reports thereon, like the ordinary mining reports of the time, were of little or no geological value. From this gradually grew up an important organization supported by direct appropriations from Congress, which contemplated the making of a topographical map of the whole area of the United States west of the 100th meridian, and which in point of numbers finally far exceeded any of the other organizations.

Its work was carried on continuously from 1871 to 1879, and produced a large number of topographical maps of the western country, a few of which were afterwards colored geologically.

Wheeler did not approve of the system of topographical survey adopted by the 40th Parallel and subsequent surveys, but conducted his work after the manner of earlier military expeditions, by making meander lines along the valleys, instead of triangulations from the summits of the ridges, the principal basis of his details of topographical structure. His maps, morever, were drawn in hachures instead of in contour lines.

In spite of the somewhat discouraging peculiarities of organization, the geological work done under this survey reached a high standard of excellence, owing to the ability of the men to whom it was entrusted. First among these was Gilbert, who as chief geologist, worked in the Great Basin of Nevada, in eastern California and southwestern Utah in the summers of 1871 and '72, visiting the plateau region around the mouth of

the Canyon of the Colorado in the former year; he had A. R. Marvine as his assistant in 1871, and E. E. Howell in 1872. In 1873–'74 he extended his investigations further south into New Mexico and Arizona, and in the following year left to join the Powell Survey.

Gilbert in his reports on the work of these years (published 1875) did not pursue the descriptive method in presenting the results of his geological observations, but discussed them at once as a whole under general heads.

In this way he first characterized what he designated the 'Basin Range' system of mountain uplift, as brought about mainly by faulting, in contrast to the structure of the Appalachian Mountains, which is produced mainly by plication. The geologists of the 40th Parallel regarded the uplift of the narrow ranges of Nevada, from which the term was derived, to be produced primarily by folding, and that the faulting was a later phase in Tertiary or post-Tertiary time, in contradistinction to the more modern interpretation of Basin Range structure as a system of tilted beds without plication.

His volume also contains able discussions on land sculpture and erosion, on the Glacial period, and the conditions attending the drying up of the ancient lake which once filled the Utah basin, and to which he gave the name of Lake Bonneville, from the explorer who first determined that the basin has no exterior drainage. He also had a chapter on recent volcanic manifestations and a section of the rocks shown in the Canyon of the Colorado.

In 1873 Prof. J. J. Stevenson was also employed on the Survey and made a rapid reconnaissance through the greater part of Colorado. Hurried as this work necessarily was, his report shows the grasp of mind of the trained geologist, but his results were soon superseded by the more detailed areal work of the Hayden Survey.

In 1874 E. D. Cope did some field work as vertebrate paleontologist, and in 1875 Jules Marcou was attached to one of the Californian parties and determined the Tertiary age of the Tejon beds. In 1876 A. R. Conkling was attached to the Survey as geological observer, and 1877 J. A. Church made a second study of the Comstock lode, the results of which appeared in a private publication.

J. J. Stevenson was again attached to the Survey in 1878 and 1879, with I. C. Russell as assistant, during which time he had an independent party under his own charge, and he was making valuable contributions to the geology of southeastern Colorado and northern New Mexico, when by legislative enactments the Survey came to an end.

From a geological point of view the system pursued on the Wheeler Survey was less advantageous and, in proportion to the expense, less productive of permanent additions to geological knowledge of the country involved than either of the other organizations. The parties as a rule were under the charge of a military officer, who might have ideas of military discipline not always consonant with the best interests of geological work.

Black Hills Surveys. Among military reconnaissances the more important from the geological point of view were those undertaken as a result of the mining excitement in the Black Hills, of the attacks upon miners by the Sioux Indians, within whose reservation they lay, and their consequent appeals for government aid and for the opening of the reservation for white settlement.

The reconnaissance across the southern end of the hills, returning around their northern flanks, which was under the command of Capt. Wm. Ludlow, in the summer of 1874, was accompanied by N. H. Winchell and Geo. B. Grinnell as geolo-

gists. It was their first experience among Western geological formations, and considering the rapidity of the march it is not surprising that no considerable additions were made to the geological knowledge of the region.

In the summer of 1875 and 1876, however, Wm. P. Jenney and Henry Newton were sent out under military escort to investigate the mineral resources and geology of the Hills, in order to determine whether the reports of the great mineral wealth were well founded. The untimely death of Mr. Newton, who was a most promising young geologist, delayed the publication of the scientific results of this investigation, which was finally accomplished in 1880, under the editorial supervision of Mr. G. K. Gilbert, who kindly undertook the very delicate task of putting in form the field notes of Mr. Newton.

Among other reconnaissances to which geologists were attached may be mentioned those in 1873, of Capt. W. A. Jones, in northwestern Wyoming, with T. B. Comstock as geologist, and that of Lieut. E. H. Ruffner, into the Ute county around the San Juan Mountains, on which Prof. H. Hawn and L. Hawn served in geological capacities.

In the year 1875 E. S. Dana and G. B. Grinnell accompanied the party of Capt. Wm. Ludlow on a reconnaissance from Carroll, Montana, to the Yellowstone Park. On this trip they got glimpses of the isolated groups of mountains rising out of the plains, such as Little Rockies, Crazy Mountain, etc., that have yielded such interesting petrographical data of later years. They collected Saurian remains in beds overlying the Fox Hills Cretaceous at the mouth of the Judith River and made many interesting observations on probable unconformities in the Bridger Mountains and elsewhere.

The eagerness with which geologists have pursued their investigations into the new fields of geological observation, opened up by these various explorations, may be compared in a certain sense with that which takes possession of prospectors and miners upon the discovery of some new and extraordinarily rich mining district.

In their emulations to obtain possession of some of the stores of scientific wealth which nature has exposed to view, and to gain the reward of scientific reputation which is accorded to the first discoverer, they are sometimes inclined to neglect the rights of priority which scientific courtesy accords to the first occupant of a new field.

Thus the publication of Powell's geological report was, in so far as it related to the Uinta Mountains, in contravention of a more or less definite agreement among the heads of the various surveys not to encroach upon the areas covered by the maps of the 40th Parallel Survey, since the work of this Survey was strictly confined within previously prescribed limits, while the whole West lay open to the others. Powell's report was published in 1876, and the topographic base of the 40th Parallel map of the Uinta Mountain region had been used, by permission but without acknowledgment, in the preparation of the map which accompanied that report. Furthermore, during the summer of 1875 the geologically colored map of the same region, prepared by the geologists of the 40th Parallel, was in press in the cartographic publishing house of Julius Bien, and upon its final completion on November 12, 1875, Mr. King sent out to the leading geologists of the country 12 copies of these maps signed and dated by the authors, in the hope of securing to them the priority of record which was their due.

Already in 1873 friction had sprung up between the Hayden and Wheeler Surveys. Neither was willing to accord to the other the exclusive right to survey any particular part of the geologically unexplored regions,

and each claimed the privilege of stretching its work over the whole unsurveyed area of the West. Thus in this year each party had geological and topographical parties covering the same ground in Colorado, which was a deplorable dissipation of energy when so much ground was untouched by either party. As time went on, this friction increased to such an extent that the influence of one party with Congress was used to curtail the appropriations allotted to the other.

At first glance it would seem that such disagreement among men, whose sole object was avowedly the advancement of science, was most unfortunate, but here again the truth of the old saying about an 'ill wind' was again proved, for Congress, unable to decide of itself on the merits of the contending parties, referred the matter to a committee of the National Academy of Sciences, and, acting on their report, passed a bill terminating all the previously existing explorations and creating the United States Geological Survey. Thus, instead of a number of rival organizations with no necessity of concordant action between them, and each liable to pass out of existance at any time by the failure of Congress to pass its annual appropriation, there has resulted the present organization, which forms a constituent part of the Department of the Interior, and has thereby acquired a permanence which invites the best scientific talent of the country to take part in its work.

S. F. EMMONS.
U. S. GEOLOGICAL SURVEY.

PROFESSOR EUGEN BAUMANN.

ON the 2d of November, 1896, occurred the death of Dr. Eugen Baumann, professor of chemistry in the medical faculty of the University of Freiburg, in Baden. The deceased was born in Würtemberg, in 1846, and obtained his early education at Stuttgart. After studying chemistry, physics and natural sciences, at the Stuttgart Polytechnicum, where he worked under Fehling, he served an apprenticeship as apothecary in his father's employment, and in 1870 passed the pharmacists' examination at Tübingen. This was the occasion of his first meeting with Hoppe-Seyler, to whose encouragement and inspiration his career as an investigator owed its beginning. A life-long friendship was formed between the two men, and only a few months before his death Baumann paid fitting tribute to his great teacher in an obituary published with Kossel.*

Already an assistant to Hoppe-Seyler, Baumann obtained his doctor's degree at Tübingen, in 1872, with a dissertation on vinyl compounds.† When Hoppe-Seyler was called to take charge of the instruction in physiological chemistry in the newly opened German university at Strassburg, Baumann accompanied him thither as his first assistant, and in 1876 became 'Privatdocent' in chemistry. At the opening of DuBois Reymond's new physiological institute at Berlin, in 1877, Baumann was appointed to have charge of the chemical laboratory; upon his departure from Strassburg the medical faculty honored him by conferring the degree of doctor medic. *honoris causa*. In 1882 Baumann was appointed professor extraordinarius in the Berlin medical faculty, and in October, 1883, he accepted a call as successor to v. Babo at Freiburg, where he labored without interruption until his death. He declined the call to succeed Hoppe-Seyler at Strassburg and only recently the title of 'Hofrat' was bestowed upon him.

Baumann's earliest researches were intended to throw light upon the behavior of sarcosin in the organism. To this period belong the beginnings of the researches on the aromatic substances of the body—a

* Zeitschrift für Physiologische Chemie, Band 21.
† Ann. Chem. Pharm. Band 163. S. 308.

field of work which occupied Baumann's attention during his entire life. The observation that phenol bodies constantly present in the urine are not derived from the aromatic substances in the vegetable foods was followed by the important discovery that these bodies are excreted combined with sulphuric acid in the form of ethereal sulphates. With the isolation of these compounds (*e. g.*, phenyl- and cresylsulphates) there was introduced into physiology the knowledge of a new class of syntheses in the organism, comparable to the well known synthesis of hippuric acid. The finding of phenol as a putrefaction product of proteids led to the announcement that the aromatic substances of the urine largely owe their origin to the putrefactive decomposition taking place in the alimentary tract. The products, many of them strongly toxic, are absorbed and reappear in relatively harmless combination with sulphuric acid. Ethereal sulphates were shown to be absent in the urine when intestinal putrefaction is totally suppressed, and physiologists have come to look upon the quantity of combined sulphuric acid excreted as the best indication of the intensity of the decomposition in the intestine. The so-called 'indican' of the urine was also drawn within the scope of these investigations and was shown to be quite distinct from the vegetable glucoside indican, although yielding indigo on oxidation. After Jaffé had demonstrated that the chromogen of the urine is derived from indol, Baumann and Brieger proved that it is in reality an ethereal compound of indoxyl with sulphuric acid, analogous to those already mentioned. It is scarcely necessary to remark that these discoveries have had a far-reaching influence on practical medicine.

The behavior of sulphur compounds in the animal organism was another favorite theme to which Baumann and his pupils contributed extensively. The study of the compounds of mercapturic acid which can be obtained under appropriate conditions in the urine, yielded the proof that there is formed in intermediary proteid metabolism an atom-complex closely related to the organic sulphur compound cystin, excreted as such in the rare cases of so-called cystinuria. It was shown that the cystin is accompanied under these circumstances by at least two diamines (putrescine and cadaverine) which are found in both urine and fæces. The peculiar perversion of metabolism known as alcaptonuria was also shown to owe its peculiarities in many instances to a dioxyphenylacetic acid, the synthesis of which was accomplished in the Freiburg laboratory.

Among Baumann's pharmacological investigations may be mentioned in particular his researches on the sulfones, which led to the discovery of several widely used hypnotics: sulfonal, trional, etc. Together with Kast and others he studied their physiological action and demonstrated that only those are effective which are transformed in the body, the intensity of their action being dependent upon the number of ethyl groups present.

Scarcely more than a year ago the finding of iodine as a normal constituent of the animal body and the isolation of thyroiodin (iodothyrin), the physiologically active substance of the thyroid glands, aroused the interest and admiration of the medical world. Baumann was actively engaged in the solution of many problems suggested by this last great discovery when, after an illness of only two days, death put an end to a brief but brilliant career.

It is impossible in a brief sketch to give more than an outline of some of Baumann's contributions to physiological chemistry. His loss will be felt not alone by chemists, but also in the broader circle of investigators in scientific medicine; for Baumann exercised a wide influence as a teacher, as

well as through his permanent researches. Among those who benefited by his guidance may be mentioned the names of Brieger, Goldmann, Herter, Hürthle, Kast, C. Th. Mörner, Preusse, Röhmann, Schotten v. Udránszky, N. Wedenski. One who came into personal contact with the man could not fail to admire his untiring devotion to science, and to feel grateful for the inspiration derived from him.

LAFAYETTE B. MENDEL.
YALE UNIVERSITY.

ALFRED TRESCA.

THE session of November 27, 1896, of the '*Société d'Encouragement pour l'Industrie nationale*,' under the presidency of M. Mascart, was devoted mainly to ceremonies in memory of the late M. Alfred Tresca, recently deceased. The discourse pronounced by M. Haton de la Goupillière was the main feature of the evening programme.

Monsieur A. Tresca was the son of the distinguished investigator, Henri Tresca, who was the successor of General Morin as the head of the *Conservatoire des Arts et Métiers*, and who followed and improved upon the methods of the latter in the prosecution of researches of importance in the field of applied science, and especially in the investigation of the characteristics of the materials of construction and of the most important classes of prime movers and other machines. The younger Tresca followed in the same path and gave his life to similarly valuable work. The three men have lead rather than followed in all developments in their department of work during the century. The work of Morin on the properties of the materials of engineering and his extensive introduction, in original ways, of graphical methods of illustration, the extensive study by the elder Tresca of the heat-motors, and the researches of the younger Tresca in applied physics and engineering, have been the principal contributions of the *Conservatoire*, for many years past, to their department of science. It is an interesting case of 'intellectual heredity,' as the writer has called it. A personal acquaintance, slight, but quite sufficient to confirm the conclusions here reached, impressed the writer also with the fact that the influence of each upon his successor, in this respect, was deep and most effective of result. The three men, talented, industrious and persistent, by similar methods accomplished similarly useful work.

As M. Haton says: "Inheritor of a name illustrious in science and honored also for services rendered our society, he has firmly upheld its prestige. Trained in the school of his father, Henri Tresca, he learned the traditions of industrial science, that difficult science, and, at the same time, traditions of honor and of labor to which he was always faithful." He was always inclined to avoid public notice, "but his colleagues, his students, unanimously render just tribute both to the extent of his work and to its value in instruction." The address closes with an affectionate and graceful tribute of esteem and admiration, of grief and of eulogy.

R. H. T.

CURRENT NOTES ON ANTHROPOLOGY.

ANCIENT MAYAN HISTORY.

A YUCATECAN author, Don Juan Francisco Molina Solis, has recently written a meritorious history of Yucatan (Historia del Descubrimento y Conquista de Yucatán, pp. 911. Merida, 1896). By way of introduction it has a sketch of the ancient history of the peninsula, covering sixty pages

This discusses the early immigrations, the foundation of the great cities, the establishment of the confederation which for some generations appears to have controlled the peninsula and allowed a peaceful development of its culture, and its unfortunate violent dissolution leading to the destruction of the former mart of Chichen Itzá

and the capital, Mayapan. This breakdown took place in the first half of the fifteenth century, probably about 1420.

The author presents the surviving fragments of this story in clear and attractive language, basing his statements on the the best authorities and some unpublished documents. His work as a whole is of high character, and will take a worthy rank in the historical literature of Spanish America.

PRIMITIVE DRILLS AND DRILLING.

To bore a hole seems a simple affair, but it took man a long time to learn how to do it. Mr. J. D. McGuire, in the *Report* of the United States National Museum for 1894 (just issued), devotes a hundred and twenty-five pages to the subject. He claims, indeed, in his opening sentence that "The earliest remains of man are found associated with implements of his manufacture in which holes have been artificially perforated." This is incorrect, as the remains of the Chellean period are not perforated, and he himself offers no evidence to that effect. Nor does he give the right explanation for the 'batons of command' of the cave period. They are arrow-straighteners and are still used by the Eskimo.

These are small matters. The article in all its leading features is clear, profound and convincing. He surveys all the forms of drills and hole-making implements of primitive times—pins, bodkins, needles, awls, etc.—and illustrates how they were used and for what purpose. Fire-drills are abundantly represented, and the theory that the Egyptian *Sam* is a drill is ably defended. Numerous cuts render the text easily comprehended, where mechanical devices are discussed.

THE STATE AND ITS SOIL.

Prof. Frederick Ratzel is one of the best known students of the relations of earth to man. His prize essay, 'Der Staat und sein Boden, geographisch betrachtet' (Leipzig, 1896, pp. 127), is a careful discussion of the influence which the soil and its accessories bear upon the character and development of the inhabitants. It considers the state as a 'territorial organism,' explains the connection between the natural and political areas, traces the development of this connection, and maintains the nigh inseparable association of the two.

Prof. Ratzel is always a clear, agreeable writer. His learning is adequate to his subject. To many readers, however, this and his other works will seem to be a little arid and incomplete, from the absence of warmth of touch, of psychical sympathy, or, perhaps, want of consideration for the predominance of the will and the emotions in the affairs and the evolution of mankind.

D. G. Brinton.
University of Pennsylvania.

SCIENTIFIC NOTES AND NEWS.

THE DAVY-FARADAY RESEARCH LABORATORY.

The Davy-Faraday Research Laboratory, which we have already described, was opened by the Prince of Wales on December 21st. The laboratory, which Dr. Ludwig Mond has presented to the Royal Institution, has cost for its building, equipment and endowment about $500,000. The laboratory is to be devoted to research work in physics and chemistry, and Lord Rayleigh and Prof. Dewar have consented to undertake the directorship. Dr. Mond made an address in the course of which, according to the report in the London *Times*, he said that psrsons of either sex or any nationality would be welcome within its walls who could satisfy the laboratory commmittee that they were fully qualified to undertake original scientific research in pure and physical chemistry, and preference would naturally be given to those who had already published original work. If this country had distinguished itself in one way more than another in that glorious rivalry with other nations for extending our knowledge of natural phenomena and our power over the forces of nature it had been by the large num-

ber of contributors to our knowledge, who on the Continent would be called amateurs in science—men who devoted their lives to the study and advancement of science from pure love for the subject. He need only instance the names of Cavendish, Joule and Darwin to show that they included men of the very highest rank. In giving this laboratory to the English nation he had done so in the firm conviction that this country would continue to bring forth in the future, as it had done in the past, men of the same rank and of the same devotion to science for its own sake, and it was a fond hope of his that such men would find there all the facilities and all the necessary appliances for carrying out their researches. The further we advanced in the study of nature the more accurate and elaborate was the apparatus required, and the more difficult it became to carry on delicate work in a private laboratory. He had placed that laboratory in the center of London because he believed that this great city would continue to be the intellectual center of the civilized world, where the brightest minds would congregate. He had intrusted it to the Royal Institution so as to insure its being open to men and women of all schools and of all views on scientific questions.

THE MARINE BIOLOGY OF GREAT BRITAIN.

THE committee of the British Association on the marine zoology, botany and geology of the Irish Sea presented, at the Liverpool meeting, its fourth and final report. The committee consisted of ten members, with Prof. W. A. Herdman as chairman and reporter. The report reviews the earlier work by the Liverpool Marine Biology Committee and the investigations carried out in the Puffin Island station since 1887. That committee, in addition to annual reports, has published three volumes of the fauna, recording 2,133 species. In 1892 the committee relinquished Puffin Island and built the new biological station at a very much more convenient and richer locality, Port Erin, at the southwest end of the Isle of Man. In the following year a second building—the Aquarium—was added, and since then the institution has been constantly in use and has proved increasingly useful each season, both to members of the committee and to other naturalists. Since the opening of the Port Erin station, in 1892, 56 biologists have paid over 200 longer or shorter visits for the purpose of working at the marine fauna and flora. The British Association Committee for the investigation of the Marine Zoology, Botany and Geology of the Irish Sea was appointed in 1892, and three previous reports have been submitted. The first, laid before the Nottingham meeting in 1893, gave an account of the limits and more prominent physical conditions of the area under investigation, with a brief interim notice of the dredging expeditions undertaken during the year. The second report, at the Oxford meeting in 1894, gave a fuller description of the methods of work on one of the dredging expeditions, and also included an account of the distribution of the submarine deposits of the area and a notice of the chief results of the year's work, including some new species. The third report, given at Ipswich, dealt chiefly with the submarine deposits, the investigation of the surface currents, and with the distribution of animals as shown from dredging statistics. In the present final report the committee gives for the first time a complete list of all the species recorded from the area of the Irish Sea investigated. This list fills 28 pages. The greater part of the work of the committee has been zoological; botany, however, has been represented by several investigators, and lists are given of the marine algæ, including diatoms.

DURING the last fifty years, says *Nature*, much work has been done by marine naturalists all round the British coasts, with a view to determining the distribution of those animals which live on the floor of the sea. It has been fully recognized that the localities frequented by many marine species are very definite and extremely limited in extent, and that both the nature of the sea bottom and the creatures which live there exhibit as much variety as we are accustomed to find on land. The Marine Biological Association, with the assistance of a grant made for the purpose by the Royal Society, has recently been engaged in an attempt to place our knowledge of this subject upon a sounder basis by investigating in detail some of

the grounds in the neighborhood of Plymouth, including important fishing grounds, with reference to the nature of the sea bottom at each locality, and the whole assemblage of animals found there. Detailed charts are being prepared to exhibit the variations which take place from point to point. No attempt has previously been made to study fishing grounds with such thoroughness, having regard not only to the fishes, but to the whole collection of animal life which forms the basis of the food upon which the fishes exist. The investigation, which has involved a large amount of dredging and trawling, as well as the identification of the numerous species captured, has been carried out by Mr. E. J. Allen, the Director of the Plymouth Laboratory.

GENERAL.

THE remains of Pasteur were removed, on December 26th, from the Cathedral of Notre Dame to the Pasteur Institute, where the cortège was met by members of the Academy, representatives of the government and delegates from learned societies and foreign countries. Speeches were made by M. Rambaud, M. Bodin; Sir John Evans, representing the British Association; Sir Dyce Duckworth, representing the Royal College of Physicians, and others. A mausoleum, to be decorated with designs illustrating Pasteur's contributions to science and industry, has been built at the Institute.

DR. THEODORE G. WORMLEY, since 1877 professor of chemistry and toxicology in the University of Pennsylvania and the author of important contributions to these sciences, died at Philadelphia on January 3d, aged seventy years.

THE death is announced, in his eightieth year, of Mr. Horatio Hale, of Clinton, Ontario, well known for his contributions to our knowledge of the languages and customs of the North American Indians.

DR. F. BUKA, professor of geometry in the University of Berlin, died on December 4th, at the age of forty-five years.

MR. EDWARD FALKENER, the English archæologist, died on December 17th, in his eighty-third year.

SIR HENRY MANCE has been elected President of the Institution of Electrical Engineers, London.

M. LIARD, the head of the University Department of the French Ministry of Education, has been elected a member of the Academy of Moral Sciences in the place of the late M. Jules Simon.

THE tercentenary of the birth of Descartes has been celebrated at Tours by the local archæological society, two addresses being delivered and verses composed by M. Sully Prudhomme being recited. A pilgrimage has also been made to the house at La Haye in which Descartes was born.

THE jubilee of the entrance into professional life of Dr. Roussel, of Paris, has been celebrated at the Sorbonne. Mr. Barthou, Minister of the Interior, presented him with a gold medal, and his bust was unveiled. In 1874 Dr. Roussel, who has been a Deputy and is now a Senator, carried a bill for the protection of infants placed out at nurse. This measure checked the abuses of baby farming. Dr. Roussel has also effected legislation against drunkenness, for the protection of foundlings, and for gratuitous medical aid for the poor.

MR. FREDERICK IVES gave a lecture, on December 16th, at the Fine Arts Societies Galleries in London, on his method of photography in natural colors, and exhibited photographs so taken.

AT the annual business meeting of the Geological Society of Washington, held December 23, 1896, officers for the ensuing year were elected as follows: President, Arnold Hague; Vice-Presidents, J. S. Diller and Whitman Cross (re-elected); Treasurer, M. R. Campbell; Secretaries, C. Willard Hayes and T. W. Stanton (re-elected); Members-at-Large of Council, S. F. Emmons, G. K. Gilbert, R. T. Hill, G. P. Merrill and Chas. D. Walcott. Mr. Walcott subsequently tendered his resignation from the Council, leaving a vacancy.

THE American Economic Association held a successful meeting at Baltimore, ending December 31st. The following officers were elected: President, Henry C. Adams, Ph. D., Michigan; Vice-Presidents, Franklin H. Giddings, M. A., Columbia, E. R. L. Gould, Ph D.,

Johns Hopkins, Roland P. Falkner, Ph. D., Pennsylvania; Secretary, Walter F. Wilcox, Ph. D., Cornell; Treasurer, Charles H. Hull, Ph. D., Cornell.

THE Swedish Consul-General at Shanghai has telegraphed to Stockholm that Dr. Sven Hedin, the Scandinavian traveller, has arrived at Liang-chau-fu, in Kansu, to the northeast of Lake Koko Nor, after a successful journey through the unknown regions of northern Tibet by way of Tsaidam and Koto Nor. Dr. Sven Hedin hopes to reach Peking in two months' time.

DR. ANDRÉE proposes to repeat his attempt to reach the North Pole by balloon this year. Dr. Knut Frankel expects to accompany him as meteorologist in place of Dr. Ekholm. It is also reported that MM. Godard and Surcouf, two French aëronauts, propose making a similar attempt in 1898.

THE *Lancet* states that some interesting 'Druidical' remains on and around Dartmoor have been destroyed by the contractors of the Newton Royal District Council, who have broken up the stones for repairing the surface of the roads. The remains known as the Stone-avenue, at Bel Tor corner on Sherberton-common, have been demolished, and several 'hut circles' and 'mainhir' have completely disappeared. Fortunately the work of destruction has been now stopped by the energetic action of Exeter antiquaries, but the loss of these interesting relics is much to be deplored.

ACCORDING to the report of the Board of Health of New York City the death rate for 1896 was 21.54 as compared with 23.105 in 1895, and an average of 26.63 for the five preceding years. The total number of deaths during 1896 was 41,652, and of births 55,723. The estimated population of New York City on July 1st was 1,934,077.

THE Common Council of Brooklyn voted November 30th to establish a public library for that city, in the interest of which a public meeting will be held at the Brooklyn Academy of Music, January 14, 1897, in connection with the joint meeting of the New York Library Association and New York Library Club which occurs the same day at the Art Institute.

THE New York *Evening Post* reports that in the Berlin Museum of Ethnology the large and valuable collections of Gustav Nachtigal have now been placed. These collections date from 1884–85 and comprise all sorts of objects from the west coast of Africa, beginning on the Orange River south and ending on the Volta north. All the objects are flawless, and among them are full native equipment in weapons, tools, apparel, religious rites, household utensils, etc., the finest pieces coming from Borneo, Wadai, Darfoor, Kordofan, and from the districts along the Niger and in the Sudan. Some of the native garbs are exquisitely woven and ornamented, silk and gold.

THE William Gossage Laboratory and the extension of the chemical laboratories of University College, Liverpool were opened on December 12th, by the Earl of Derby. The former includes a large laboratory with accommodations for 44 advanced students, and in the basement is an additional lecture room to seat 70 or 80, a preparation room and a gas-analysis room. The other new buildings comprise a metallurgical laboratory, with furnaces and other equipments, an important addition to the research laboratory, store-room for apparatus and chemicals, a dynamo room, electric-accumulator room, and a heating chamber. The William Gossage Laboratory was built by Mr. F. H. Gossage and Mr. T. Sutton Timmons, at a cost of £7,000, and presented to University College. To connect the laboratory with the old building, other buildings are being provided by public subscription, and the cost will be about £4,000. The opening address was delivered by Prof. W. Ramsay.

IT is reported that patents for inventions which relate to the production of electrical energy, or in which electricity is in any way employed, are refused in Turkey. There is nothing in the law to warrant any such refusal, and the only explanation afforded by the Turkish authorities is that orders have been received 'from the Palace' forbidding the grant of patents for such inventions. The fees paid on application are not returned.

MR. FRANCIS GALTON recently contributed to the *Fortnightly Review* an article describing

how a system similar to that of the Morse code might be used in signalling to the planets. We now find in a leading daily paper an article with the headline 'Mars is Signalling Us,' including an account of the method by which the signals are recorded in 'one of the great European observatories.'

It is probable that but few people realize the number of 'scientific' journals published in America. One of these which has now concluded its tenth volume is devoted to 'Koreshanity,' founded on "Koreshan astronomy, the basis of which makes the sun the center and the earth the circumference of the universe, from which it is conclusive that the earth is a hollow sphere, with its habitable surface concave, forming an integral, alchemico-organic structure, which, as demonstrated in the cellular cosmogonic system, perpetuates itself through the eternal and causative forces and functions operating within it."

A petition has been received asking subscriptions in aid of those who suffered from the effects of a waterspout on the island of St. Michael, in the Azores. It is stated in the petition that on November 25th a great waterspout broke over the city of Povoacao, of about twenty-five thousand inhabitants. Almost in an instant the deluge mounted above the roofs of the houses, after tearing up the pavement of the streets in its course, and digging trenches in them, in some places fifteen feet below their ordinary level. It was in the night that the waterspout broke, and the great torrent, rushing down the slopes to the sea, tore a wide channel through nine miles of country, bearing away the homes of thousands of people and causing great destruction of life.

A serious landslide has occurred near Rathmore, County Kerry, Ireland. Part of the earth composing a bog, carrying with it rocks, trees, houses and animals, has been swept into the river Flesk and the lakes of Kilarny.

Giant's Causeway, in the north of Ireland, from the early part of the last century down to the present day, has been visited by a largely increasing number of persons without let or hindrance, and it is now annually visited by about 80,000 persons. A small limited liability company was formed in June last for the purpose of enclosing the causeway and making a profit out of it by charging a toll for admission. A few months ago they began to put up an iron fence, and they have brought an action against three gentlemen who persisted in walking over the causeway. To defend the public right of access to it, the National Footpath Preservation Society has issued an appeal for funds to defend the case.

According to cablegrams to the London *Times*, vigorous measures are being taken in South Africa to stop the spread of the rinderpest. The Premier of Cape Colony has stated that the disease had not advanced towards the colony in the past two months. The government were utilizing the peculiar geographical advantages of the conntry, which would enable the border to be fenced from the Atlantic on one side to the Indian Ocean on the other, and they entertained distinct hopes of saving the colony and Pondoland from the ravages of the epidemic. The government, Sir Gordon Sprigg added, were doing everything that was humanly possible to that end, and the farmers and natives, to whom he had fully explained the situation, were anxiously assisting the efforts of the government by every means in their power. Major Leutwein, Governor of German Southwest Africa, took measures at the beginning of October to prevent the introduction of rinderpest into the colony. The southern border has been entirely closed by means of patrols between the existing stations, and in the Simon Kopper territory, near the Kalahari desert, an additional station has been erected. The eastern frontier is guarded by stations and patrols which, though sufficient to prevent men or cattle from crossing the border, are unable to hinder the movements of game or wild animals. To the north and northeast similar measures are being taken to prevent the introduction of the disease from the neighborhood of Lake Ngami. It is to be hoped that the praiseworthy efforts of the German authorities to prevent the spread of the rinderpest may be crowded with success.

The New York Academy of Medicine will celebrate the semi-centennial of its foundation on January 29th. There will be exercises in

Carnegie Hall at which addresses will be made by President Cleveland, Prof. Jacobi and others, and afterwards there will be a reception at the building of the Academy, the corner stone of which was laid by President Cleveland in 1889.

BRANCHES of the British Medical Association are being formed in the leading cities of Canada as a preliminary of the visit of the Association next year. Montreal, Ottawa, Halifax and Winnipeg have already strong local branches.

UNIVERSITY AND EDUCATIONAL NEWS.

THE cablegram report that Alfred Nobel had left his fortune to Stockholm University is now said to be incorrect. A cablegram from Stockholm, dated December 31st, states that the fortune, valued at $10,000,000, is almost entirely bequeathed for the foundation of an international fund for the advancement of scientific research.

THE Stevens Institute of Technology, Hoboken, N. J., will celebrate its twenty-fifth anniversary on February 18th and 19th.

PRESIDENT HARPER, of the University of Chicago, has announced a deficit for the year of $48,000, and that retrenchment will be necessary especially in the direction of scholarships and assistance to students.

GEN. G. W. C. LEE has resigned from the presidency of Washington and Lee University, to take effect at the end of the academic year.

AT the inauguration of the Lyons University, the rector, M. Compayré, announced a donation to the University of £4,000. The *British Medical Journal* states that the donor is M. Auguste Falcouz, a Lyons banker. The interest of this sum is to be disposed of as follows: Every two years a prize of £40 sterling will be given to the students of each of the four faculties—literature, science, law and medicine—who write the best essay on a current subject. All French students under 30 years of age can compete. The subject of the essay will be chosen by the Council of the Lyons University a year in advance. Every two years instruments for the science and medical faculties will also be bought. When fifty years have elapsed, the Lyons University will have entire control over the capital in order to be able to meet the demands of scientific progress.

THE Austrian government has brought in a bill on the salaries of university professors. The present salary of a professor is now about $1,200, and he receives in addition the fees from students attending his courses. It is now proposed to raise somewhat the fixed salaries and let the fees of students go to the state. This would equalize the salaries of professors, but is being opposed especially by professors in the medical school whose required courses are attended by a large number of students.

WE recently referred to the action of the regents of the University of the State of New York making it illegal for colleges of the State to give the degrees A. B. and Ph. D. *causa honoris*. When colleges in other states either voluntarily or by compulsion cease giving the Ph. D. degree *causa honoris* and for study *in absentia*, those who wish to possess this 'honor' without the education it represents will need to go to the newly founded 'university' at Buenos Ayres. It appears that they can there receive the degree by a course of study in extent (information regarding its thoroughness is lacking) about equal to that in an American college as far as the end of the sophomore year. The candidates for the doctorate, it appears, need not know any mathematics, but they must study one science—geography, and that of both the 'old and new continents.'

A SECOND university will be opened in Japan during the present year. It will be at Kyoto and will for the present only include professional schools. It is also reported that a Dutch university will be established in Pretoria. An English university at Cape Town seems to be much needed.

PROF. B. HATSHECK, of Prague, has been called to the chair of zoology in the University of Vienna, vacant by the resignation of Prof. K. Claus. Prof. Th. Curtius, of Kiel, has been called to the chair of chemistry at Bonn, vacant through the death of Kekulé. Dr. P. E. Study, associate professor of mathematics at Bonn, has been called to the chair of mathematics at Greifswald. Dr. Schüsler, of the

Polytechnic Institute of Graz, has been promoted to an assistant professorship of Geometry and Dr. W. Felix, of the University of Zurich, to an assistant professorship of anatomy.

DISCUSSION AND CORRESPONDENCE.

CLOUDS OVER A FIRE.

On Tuesday, December 1st, I had an excellent opportunity to observe the formation of cumulus clouds over the smoke from a large fire. The morning was clear, with the exception of a few scattered strato-cumulus and cumulus clouds near the horizon. The wind was northwest and blowing at about 12–15 miles an hour. The fire was in the coal pockets of the Boston and Maine Railroad, in Charlestown, and burned fiercely for some hours, sending up immense volumes of smoke which were blown off to sea across the city of Boston. The cloud, as I observed it, looking from the southwest and thus obtaining a view at right angles to the smoke, was formed at some little distance to the southeast of the fire, and over a part of the smoke, which rose up higher than the rest, as is shown in Fig. 1. It was distinctly a cumulus, but its base and a good deal of its main portion were often obscured by the smoke. Fig. 2 is intended to give some idea of what was observed as the second stage in the phenomenon. The whole body of the cloud has been carried to the southeast, further away from the fire, and the effect of the stronger upper winds is seen in the blowing forward of the top of the cloud. At this stage the cloud could plainly be seen to be dissolving as it descended to lower levels.

In Fig. 3 we have represented, to the right, the third stage of the cloud, which is now rapidly diminishing in size and being carried away by the wind, while nearer the fire a new cumulus has been formed. It was noted that the formation of the cumulus in its first position, as shown in Fig. 1 and at the left of Fig. 3, was intermittent. There was not always a cloud at that point, but one grew whenever there was an especially active ascent of the smoke, and the position of this first cloud, at its beginning, was always the same with reference to the fire and the trail of smoke.

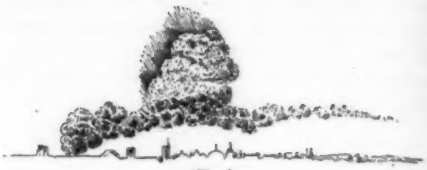

Fig. 1.

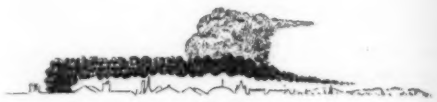

Fig. 2.

Fig 3.

Fig. 4

There seems little need of comment on this simple but interesting phenomenon. The conditions for cloud formation were not reached vertically over the fire, for the smoke was blown to leeward at once, and the warmed air did not rise high enough to reach its dew-point until it had been blown a-quarter or a-half of a mile to the southeast. For this reason Figs. 1, 2 and 3 show the cloud to the right of the fire. Looked at down the wind, *i. e.*, from the northwest, the appearance of smoke and cloud were as shown in Fig. 4.

It may be interesting to note in this connection the case of cloud formation over a fire mentioned by Espy in his *Fourth Meteorological Report*. The observer quoted by Espy was on the top of Mt. Monadnock, N. H., and saw the growth of a cumulus cloud over a fire of brush on the lowland. The cloud increased in size, and finally gave a shower of rain over a limited area.

The accompanying figures were drawn by

Mr. G. C. Curtis, Assistant in the Physical Geography Laboratory of Harvard University, from his own observations and after sketches made by the writer. R. DEC. WARD.

HARVARD UNIVERSITY,
December 19, 1896.

COMPLIMENT OR PLAGIARISM?

OUR attention has been called to a communication from Professor George Bruce Halsted in a recent number of SCIENCE in which he says that we '*took*' a whole block of problems and a long note from Halsted's Elements of Geometry.

If Professor Halsted had only printed in parallel columns extracts from Halsted's Elements of Geometry and the corresponding paragraphs in Beman and Smith's Plane and Solid Geometry, his charge of plagiarism would have fallen to the ground. For those, however, who have not the two books at hand, it may be worth while to make a few comments upon his accusation.

The *order* of the problems: To bisect a perigon; to trisect a perigon; to divide a perigon into five equal angles; to divide a perigon into fifteen equal angles, etc., is so natural that for this Professor Halsted will surely claim no originality. The same order may be found in Newcomb's Elements of Geometry, an earlier book than Halsted's.

Does Professor Halsted claim that we '*took*' our *solutions* from his book? A comparison will show only such resemblances as are inevitable when two authors are dealing with the same material.

It must then be the *terminology*, and especially the word '*perigon*,' which we have been guilty of appropriating. A modern treatment of the subject of angles requires the use of single terms for the angle formed by a half revolution of the moving arm and the angle formed by a complete revolution. To designate the former the term straight angle is now fully established; for the latter we had a choice among such terms as round angle, circum-angle, perigon, full angle, closed angle. After due consideration we chose 'perigon,' a word given in both the Century and Standard Dictionaries, and found in several geometries, among them Faifofer's (*perigono*).

Finally Professor Halsted lays especial emphasis upon the long note which we '*took*' from his Elements. We quote the two notes in full.

HALSTED.

REMARK.—From the time of Euclid, about 300 B. C., no advance was made in the inscription of regular polygons until Gauss, in 1796, found that a regular polygon of 17 sides was inscriptible, and in his abstruse Arithmetic, published in 1801, gave the following:

In order that the geometric division of the circle into n parts may be possible n must be 2, or a higher power of 2, or else a prime number of the form 2^m+1, or a product of two or more different prime numbers of that form, or else the product of a power of 2 by one or more different prime numbers of that form.

In other words, it is necessary that n should contain no odd divisor not of the form 2^m+1, nor contain the same divisor of that form more than once.

Below 300 the following 38 are the only possible values of n: 2, 3, 4, 5, 6, 8, 10, 12, 15, 16, 17, 20, 24, 30, 32, 34, 40, 48, 51, 60, 64, 68, 80, 85, 96, 102, 120, 128, 136, 160, 170, 192, 204, 240, 255, 256, 257, 272.

BEMAN AND SMITH.

NOTE.—That a perigon could be divided into $2n$, $3\cdot2n$, $5\cdot2n$, $15\cdot2n$ equal angles was known as early as Euclid's time. By the use of the compasses and straight edge, no other partitions were deemed possible. In 1796 Gauss found, and published in 1801, that a perigon could be divided into 17 and hence into $17\cdot2^n$ equal angles; furthermore, that it could be divided into 2^m+1 equal angles if 2^m+1 was a prime number; and, in general, that it could be divided into a number of equal angles represented by the product of different prime numbers of the form 2^m+1. Hence it follows that a perigon can be divided into a number of equal angles represented by the product of 2^n and one or more different prime numbers of the form 2^m+1. It is shown in the Theory of Numbers that if 2^m+1 is prime m must equal 2^{2^p}; hence the general form for the prime numbers mentioned is $2^{2^p}+1$. Gauss's proof is only semi-geometric, and is not adapted to elementary geometry.

Of course Professor Halsted is aware that from the days of Young, possibly earlier, in his Elements of Geometry, 1827, up to the present the substance of Halsted's 'long note' has been given in the better geometries, as witness Baltzer, Henrici and Treutlein, Chauvenet, Newcomb.

Professor Halsted's motive in making his charges we leave for others to determine.

BEMAN AND SMITH.

VOLCANIC DUST IN SOUTHWESTERN NEBRASKA AND IN SOUTH DAKOTA.

APROPOS of Prof. Salisbury's note on the subject in SCIENCE of December 4th, I would call attention to the fact that the occurrence of volcanic ashes in southwestern Nebraska has long been known. At the same time, notices of present exposures are of value. The deposit was at first called 'geyserite' by Prof. S. Aughey before 1880. References to the subject will be found as follows: 'Sketches of Physical Geography and Geology of Nebraska,' 1880, by S. Aughey: American Geologist, Vol. I., p. 877, and Vol. II., pp. 64 and 437; Proceedings

U. S. National Museum, Vol. VII., p. 99; Am. Journal of Science, Sept., 1886. These refer to the region in question. Closely similar deposits have been found as far east as Omaha, and as far north as the Missouri River in Knox Co., Neb.

An interesting and important question which should be kept in mind by those observing these deposits is whether there is more than one horizon shown at any one locality. Thus far I think no one has reported more than one, and it may be that all are to be referred to one eruption. If so the deposit becomes a most important reference horizon.

As a related item of intelligence I may add that this last summer I discovered a deposit of somewhat similar character extending a dozen miles or so along the South Fork of White River, in Lugenbeel Co., S. D., showing a thickness in places of more than 10 feet. This deposit is, however, of a light green color, coarser than that of Nebraska and more consolidated than I have seen there. Moreover it seems to mark the transition from the White River epoch to the Loup Fork.

J. E. Todd.

State University,
Vermilion, S. D.

SCIENTIFIC LITERATURE.

GRASSES OF NORTH AMERICA.*

The botanists of this country have been looking forward with interest for several years to the publication of the second volume of Dr. Beal's 'Grasses of North America.' Single-handed and alone, away from the larger libraries and collections, Dr. Beal has patiently and persistently carried forward the work which he has finally brought to completion and presented to the public in the volume before us. Much interest attaches to the work, for we have here presented, for the first time, in a single volume, descriptions of all the grasses of the United States and northward, which the writer was able to obtain, together with those which have in recent years been collected in Mexico by Mr. C. G. Pringle and Dr. E. Palmer. No work of similar character has before been published, and those wishing to find descriptions of our grasses, excepting for limited areas, have been obliged to consult numerous publications through which the descriptions were scattered. The total number of species described in the work, including introduced species and those cultivated for use or ornament, is 912, covering 659 pages. With few exceptions, these descriptions, which are very full, have been originally drawn up by the author. The nomenclature adopted is that of the so-called 'Rochester code,' and in every case full citations of authorities are given, considerable space being devoted to synonymy.

The author states in his preface that "it has required some courage and persistence to adhere to the work so long, realizing fully that it must contain many defects, and that perhaps its chief use would be to serve as a basis for others to enlarge in the future, correct and otherwise improve." This is very often the fate of scientific publications, and no one can hope to produce a work of any considerable extent which shall be beyond criticism or entirely free from errors. The work before us is no exception to this statement, and the criticisms or corrections here given are made in the kindliest spirit, with the intent of calling attention to some of the more important mistakes, hoping thereby to enhance the usefulness of the work, rather than discredit its value.

Collectors in preparing their labels occasionally overlook the importance of carefully noting the locality and station of the specimens gathered, and more often still they fail to note the date of collection or altitude. It is almost discouraging, and even annoying sometimes, to look over a dozen or more sheets of specimens and find nothing more definite in regard to these particulars than the name of the State—it may be 'Texas,' or again, the 'Rocky Mountains.' The author meets here a condition of things which places him at a disadvantage—by rendering his work incomplete—with the reader or student of biology, a position which might have been avoided by a trifling effort on the

**Grasses of North America*, by W. J. Beal, M. A., M. S., Ph.D., Professor of Botany in the Michigan Agricultural College, Vol. II. The grasses classified, described, and each genus illustrated, with chapters on their geographical distribution and their bibliography. Henry Holt & Company, New York.

part of the collector. The effect of this want of care in preparing labels is manifest in the work under consideration, in which the geographical distribution of the species is given, but the range is often limited to the material examined by the author. Errors in the recorded distribution of plants may, and often do, arise from incorrect determinations of species. There is an example of this given under *Danthonia sericea* Nutt., the range of which is recorded as 'New England to Florida, Colorado and California.' This species does not occur west of the Mississippi, the Western grasses referred to it belonging to other species. The occurrence of *Alopecurus alpinus* within the limits of the United States is doubtful. The specimens from the Rocky Mountains in the National Herbarium referred to that species are all *A. occidentalis* Scribn. *Sporobolus beevifolius* (Nutt.) Scribn. (*Vilfa cuspidata* Torr.) does not occur east of Ohio; there are no specimens in the National Herbarium from east of Missouri and Minnesota. The grass from Northern Maine referred to this species is a slender form of *Sporobolus depauperatus* named by Trinius *Vilfa richardsonis*. This form extends westward to the Rocky Mountains.

The scientific author employs figures to illustrate facts or to more clearly demonstrate his written statements. The author and not the artist is held responsible for their correctness. The reader has little interest in the artist unless his work possesses some special merit for which he has received general recognition, such as accuracy gained through a knowledge of the subject illustrated. This matter is here referred to because of the constant citation by the author of 'Grasses of North America,' of the draughtsmen who executed the figures used by him, and because of a few mistakes which these citations apparently render the present writer in some degree responsible.

Fig. 11, on page 35, is *Blepharidachne kingii* (S. Wats.) Hackel (*Eremochloe kingii* S. Wats.) and not *Eremochloa leersioides* (Munro) Hack. *Blepharidachne* is a genus of two species closely related to *Triodia*, and is omitted from the work.

Fig. 20 on page 77 is not *Arundinella palmeri* as stated. A, in the figure, is a spikelet of *A. brasiliensis*; a, is the floret of the same. B, is a spikelet of *A. deppeana*, and b, a floret of the same.

Fig. 22, on page 96, does not illustrate *Paspalum floridanum*, but is the reproduction of a drawing copied in part from Trinius and designed to illustrate *P. setaceum* Michx.

Fig. 37, on page 178, is incorrectly explained. A, is a spikelet of *Homalocenchrus oryzoides*, and a, is a spikelet of *H. monandrus*, and not a floret of *H. oryzoides*, as stated.

Fig. 41, page 229, illustrates a spikelet of *Stipa richardsonii* Link, and not *Oryzopsis macounii* (Scribn.) Beal. *Stipa richardsonii* Link appears to have been omitted from the work.

Fig. 53, on page 316, is said to be '*Epicampes macroura*.' The drawing was made to illustrate a spikelet of a grass (No. 3335 Pringle) which was doubtfully referred to *Epicampes bourgaei* Fourn., described on page 310.

Fig. 109, on page 525, was drawn by Scribner, but figure 81, on page 440, designed to illustrate *Opizia stolonifera*, was not.

Fig. 76, on page 527, is not '*Bouteloua texana*,' but *Bouteloua trifida* Scribn. in Proc. Acad. Nat. Sci. Phila. (1891), p. 307.

Fig. 117, on page 627, illustrates parts of a spikelet of *Brachypodium pinnatum* var. *cæspitosum* (No. 3443 Pringle), described in Proc. Acad. Nat. Sci. Phila. (1891) p. 305, and not *B. mexicanum*, as stated.

Fig. 118, page 632, illustrates some parts of *Jouvea pilosa* (Presl) Scribn., and not *Jouvea straminea* Fourn., which is figured in Bull. Torr. Bot. Club, 23 : pl., 266.

There are in the work about 160 new names, specific and varietal, arising partly from the system of nomenclature adopted, partly from the shifting of species from one genus to another and the reduction of species to varieties, or the elevation of varieties to species, and partly from the publication of new species. There are about forty species named and described, which have heretofore been unpublished, or at least unidentified, and are presumably new species. These are chiefly Mexican grasses, and, for the most part, occur in the collections of Mr. C. G. Pringle, the names in nearly all cases being those under which the species were distributed. Among the species described as new are the following :

Andropogon geminata Hackel ined.
Arundinella palmeri Vasey ined.
Paspalum pittieri Hackel MS. = Pringle 2359.
Panicum sonorum Beal.
Panicum vaseyanum Scribn. ined. = 1435 Pringle.
Pennisetum durum Beal. = 498 and 817 Pringle.
Stipa multinode Scribn. ined. = 385 Pringle.
Oryzopsis pringlei Scribn. ined. = 4759 Pringle.
Muhlenbergia pulcherrima Scribn. ined. = 1416 Pringle.
Muhlenbergia firma Beal. = 4914 Pringle.
Muhlenbergia nebulosa Scribn. ined. = 2366 Pringle.
Muhlenbergia elongata Scribn. ined. = 398 and 3477 Pringle.
Muhlenbergia brevifolia Scribn. ined. = 4736 Pringle.
Muhlenbergia laxiflora Scribn. ined. = 1412 Pringle.
Muhlenbergia strictior (Scribn.) = 1418 Pringle.
Sporobolus macrospermus Scribn. ined. = 2447 Pringle.
Epicampes anomala Scribn. ined. = 1423 Pringle.
Calamagrostis erecta Beal (*Calamagrostis plumosa* Scribn. ined.) = 4726 Pringle.
Calamagrostis pringlei (Scribn.).
Calamagrostis lactea Beal. = 1022 Suksdorf.
Trisetum filifolium Scribn. ined. = 1431 Pringle.
Trisetum sandbergii Beal. sp. nov.
Eragrostis pusillus Scribn. ined. = 2327 Pringle.
Eragrostis erosa Scribn. ined. = 415 Pringle.
Eragrostis plumbea Scribn. ined. = 2311 Pringle.
Melica parishii Vasey ined.
Poa vaseyana Scribn. ined. Too near *P. wheeleri* Vasey.
Poa subaristata Scribn. ined. (Macoun's Catalogue, without description) = 633 Tweedy.
Poa acuminata Scribn. ined.
Colpodium mucronatum (Hackel).
Graphephorum pringlei Scribn. ined. = 4765 Pringle.
Festuca howellii Hackel in herb.
Festuca vaseyana Hack. ined.
Festuca dasyclada Hack. ined.
Bromus laciniatus Beal. = 4897 Pringle.
Brachypodium pringlei Scribn. ined.
Hordeum montanense Scribn. ined.
Elymus innovatus Beal.

Several species described are presented in a manner that might lead one to infer they were published here for the first time. Among these are: *Paspalum inops* Vasey, published in 1893 (Contr. U. S. Nat'l. Herb. 1. 65); *Atropis uniaterale*, published and figured in 1893 under *Poa* (Vasey in Grasses of the Pacific Slope, t. 85); *Agrostis inflata* Scribn., published in 1894 in the Canadian Record of Science, where also was published *Poa trivialis* var. *filiculmis* Scribn. *Andropogon floridanus* was published in a Bulletin of the Torrey Botanical Club, 23: 145 (1896). It is unfortunate that unpublished names should in any case have been cited as synonyms, as the citation has no significance, and the publication here prevents their possible future use. The grasses cited under *Panicum indicum* are *P. phleiforme* Presl, a species very closely allied, to and perhaps not distinct from, *P. indicum*. *Chamæraphis* is taken up for *Setaria*, and made to include *Panicum sulcatum* Aubl., which belongs to the section *Ptychophyllum* of *Panicum*, while *Panicum palmeri* and *P. reverchoni*, the first a species of *Ixophorus*, the latter a *Setaria*, are described under *Panicum*, and classed in the section *Ptychophyllum*. *Panicum schiedeanum*, described on page 119, is also an *Ixophorus*, closely related to the species described as *Panicum palmeri*. *Chamæraphis latiglumis*, described on page 152, is not a *Setaria*, but belongs to a distinct genus, named *Setariopsis* (see Scribn. Pub. Field Col. Mus., Bot. Ser., I.: 288 (1896)). '*Chamæraphis caudata* var. *pauciflora* Vasey ined.,' for which 191 E. Palmer is cited, is a small form of *S. Liebmanni* Fourn. The synonyms cited under *Chamæraphis uniseta* are incorrect for No. 381 E. Palmer, the grass referred to. *Setaria uniseta* Fourn. and *Urochloa uniseta* Presl are *Ixophorus uniseetus* Schlecht., the species described under *Panicum palmeri* on page 120. '*Muhlenbergia lycuroides* Vasey ined.,' described on page 239, for which 489 E. Palmer is cited, is again described on page 271, under the name *Lycurus phleoides* var. *brevifolius* (Scribn.). *Pereilema* Presl, described on page 271, is cited as a synonym under *Agrostis* on page 320. *Sporobolus depauperatus* var. *filiformis* Beal, on page 296, characterized as having 'the culm 10 to 12 cm. long, exserted for more than half its length; panicle much reduced, 2 cm. long,' is *Sporobolus gracillimus* (Thurb.). *Sporobolus ovatus* Beal, for which *Sporobolus minor* Vasey is sited as a synonym, simply adds another synonym to *Sporobolus vaginæflorus* (Torr.). *Calamagrostis vaseyi* Beal, page 344, is certainly *Calamagrostis purpurascens* R. Br., a species quite distinct from *C. sylvatica* of Europe. *Calamagrostis sylvatica* var. *americana* Vasey, described on p. 347, is the same. *Spartina*

densiflora, described on p. 397, is the same as *S. junciformis* Engelm. & Gray, described on page 400. *Bouteloua ramosa* Scribn. is described on page 416, and again on page 418 it appears as a variety of *Bouteloua oligostachya*. *Leptochola polygama* (Fourn.), described on page 437, is the same as *Gouinia polygama* Fourn., a species identical with *Bromus virgatus* Presl. *Gouinia* appears to be a well established genus, and the grass in question should be named *Gouinia virgata* (Presl). *Eragrostis pallida* Vasey, described on page 479, is not distinct from *E. glomerata* (Walt.), *E. conferta* Trin., described on page 481, but it is very unlike *Ergroastis alba* Presl, the type of which has been seen by the writer. Under *Atropis fendleriana* (Steud.) is included under *Poa arida* Vasey, which is a distinct and well marked species, as are *Poa eatoni* S. Wats. and *Poa lucida* Vasey, also cited as synonyms, although the latter is very close to *Poa buckleyana* Nash. *Atropis lævis* (Vasey) is, as stated, *Poa lævis* Vasey, but that name should be changed to *Poa lævigata*. '*Festuca rubra* var. *pubescens* Vasey ined.' is the same as *Bromus secundus* Presl, and *Festuca richardsonii* Hook., *Bromus barbatoides* Beal, page 614, is *Bromus trinii* Desv. Ramaley, and not R. Pound, ought to be cited after *Agropyron violacescens* on page 635, and after *Agropyron caninoides* on page 640. *Agropyron violacescens* is *Agropyron richardsoni* Schrad. '*Agropyron glaucum* (Desf.),' page 637, is *Agropyron spicatum* (Pursh). *Poa brandegei* Scribn. in herb.,' page 544, is the same as *Poa lettermani* Vasey, described under *Atropis* on page 579. Under *Atropis pringlei* (Scribn.), page 578, *Poa pattersoni* Vasey is erroneously cited as a synonym.

There are keys to the genera under all the tribes with the exception of Hordeæ, and there are also keys to the species under the genera. The difficulty of making keys is appreciated by all who have undertaken them, and the value of good keys is at once appreciated by those having occasion to use them. A clear conception of all the species of a genus, and a sufficient knowledge of their characters to be able to express briefly their most obvious points of difference or resemblance, is essential to the compilation of a good key. The test of a key of analysis is in its use. The writer has not attempted to use the keys in the work under notice, but it is evident that they have been prepared with much labor and painstaking care. In glancing them over one is struck by the very frequent use of measurements of glumes, awns or ligules, the dimensions of which are often too slight or too inconstant to be of much value in a diagnosis.

On page 237, under *Muhlenbergia*, in a considerable series of 'g,' there are:

g. Floral glume 2.5 mm. long, ligule 2–2.5 mm. long, awn 1 mm. long.....23
g. Floral glume 2–2.7 mm. long, ligule 2–3 mm. long, [awn] 1–3 mm. long.....24

Lower down on the same page, in a series 'h,' appears:

h. Floral glume 3.5 mm. long, ligule 1 mm. long, awn 10–15 mm. long.....33
h. Floral glume 3.5–2.5 mm. long, ligule 1 mm. long, awn 10–15 mm. long.....28

These distinctions are too slight to be of much assistance to the student in running down a species.

Considering the extent of the work and the conditions under which the author labored, it is remarkable that more errors have not occurred. In spite of the faults to which attention has been called, and others not noted, due, chiefly, to imperfect proof-reading—the difficulties of which in such publications few appreciate—the work is one of much value to systematic botanists, and indispensable to those engaged in the study of the large and very interesting family of plants treated.

F. LAMSON-SCRIBNER.

Race Traits and Tendencies of the American Negro. By FREDERICK L. HOFFMAN (Publications of the American Economic Association, Vol. XI., Nos. 1, 2 and 3. August, 1896. Pp. 1–329). The Macmillan Company. Paper, $1.25; cloth, $2.00.

This work is a mine of statistical information relating to the population, viability, anthropometry, and the racial, social and economic conditions of the negro in the United States and incidentally in the West Indies; and the figures, culled with evident care from the most trustworthy sources and collected through personal

effort, are intelligently and impartially combined and discussed in a clear and attractive manner, so that, despite the scores of statistical tables, the book is easy reading from preface to conclusion.

In the first chapter, which relates to the growth and movements of the black and mulatto population, it is shown that the negro has failed to gain a foothold in any of the Northern States as an agricultural laborer; that in general he has remained in the South, contrary to the many predictions of wholesale migration; and that he does not readily lend himself to schemes of colonization, and has failed miserably in the most recent experiment of the kind (in Durango, Mexico). At the same time it is shown that the negro displays a tendency to segregate in certain sections in the South, while in the North, and to a less extent in the South, there is a tendency toward congregation in the cities.

To students of the negro problem the second chapter, 'Vital Statistics,' is of paramount interest. Here the author tabulates and discusses the rates of birth and death under various conditions among the blacks and compares them with the corresponding rates among the whites, calculates the expectation of life for blacks and whites, and examines fully the causes of mortality in both races. Summarizing the facts, it is pointed out (1) that the excess of births over deaths is greater for the whites than for the blacks in the Southern States; (2) that in the Northern States the blacks do not hold their own, since the deaths outnumber the births, the apparent increase in population being due to migration; (3) that for ten representative Southern cities the death rate for five years (1890–'94) was 20.12 per thousand for the whites, and 32.61 for the blacks, indicating a steady and apparently irresistible vital decline, both relative and absolute, on the part of the latter; (4) that the excess of negro mortality is greatest in the age period under 15 years, culminating among infants, and (5) that hence the number surviving to productive and reproductive ages is considerably less for the blacks than for the whites; (6) that the expectation of life among the blacks is from 12.5 to 17.11 years less than among the whites in the cities giving most reliable statistics; (7) that the rates of mortality among blacks and whites are not materially affected by other conditions than those of race and heredity; and (8) that since emancipation, mortality among the blacks has steadily increased, while the white death rate has diminished. It is shown that the chief causes of excessive mortality among the blacks are (1) diseases of infants, including premature and still births; (2) consumption, which is increasing among the blacks and decreasing among the whites; (3) pneumonia; (4) scrofula and venereal diseases, which are much more prevalent among the blacks and which are increasing; (5) malarial fevers (contrary to general opinion); and (6) typhoid fever at the earlier ages. The observations collated indicate that smallpox is more prevalent among the blacks, chiefly through greater neglects of vaccination; that scarlet fever, yellow fever, appendicitis and carcinoma uteri, from all of which the negro is generally supposed exempt, occur, but less frequently than among the whites, as is the case also with insanity, suicide, measles, diphtheria, tumor-cancer and alcholism; while the mortality from childbirth and puerperal fever is greater among the blacks by reason of ignorance and maltreatment. "The general conclusion is that the negro is subject to a higher mortality at all ages, but especially so at the early age periods. This is largely the result of an inordinate mortality from constitutional and respiratory diseases. Moreover, the mortality from these diseases is on the increase among the colored, and on the decrease among the whites. In consequence, the natural increase in the colored population will be less from decade to decade, and in the end a decrease must take place. It is sufficient to know that in the struggle for race supremacy the black race is not holding its own; and this fact once recognized, all danger from a possible numerical supremacy of the race vanishes" (page 148).

The third chapter is devoted to anthropometric facts, figures and opinions derived from various sources. The figures indicate that the weight of the black is somewhat greater and his stature somewhat less than the weight and stature of the white of the same class; that the lung capacity in the black is considerably less and

the frequency of respiration somewhat greater than in the white; that the lifting strength of the white is the greater, and that the vision of the black is inferior, though he is less liable to disease of the eye. The impressions and opinions of various students appear to indicate that during slavery the black was 'physically the equal if not the superior of the white, and this view has been fully sustained by the statistics of mortality, which also ranked him the equal if not the superior of the white thirty years ago' (pages 175–6); but that since emancipation the black has deteriorated materially, both in physical development and in viability. "And the opinion is warranted that * * * the tendency of the race has been downward. This tendency, if unchecked, must in the end lead to a still greater mortality, a lesser degree of economic and social efficiency, a lower standard of nurture and a diminishing excess of births over deaths. A combination of these traits and tendencies must in the end cause the extinction of the race" (page 176).

The fourth chapter deals with 'Race Amalgamation' in a statistical way, so far as the available data permit, but with abundant references to the opinions of students. It is recognized that the American negro 'is largely a cross between the African and the white male' (page 177), and that very little pure African blood remains; it is also recognized that, since the emancipation, the admixture of the races has been materially checked and is constantly diminishing, with a concomitant tendency toward the development of a distinctive race of mixed blood, to which the foregoing facts and figures apply, and of which the before-mentioned features and tendencies are characteristic. It is shown that the roseate dreams of radical Abolitionists thirty years ago concerning the absorption of the blacks, with attendant improvement in the whites, have faded as time has widened the chasm between the races; the shocking immorality of the blacks, as indicated by illegitimate births in Washington and elsewhere, is set forth in the records; and the physical deterioration of the black race is, at least implicitly, ascribed to the moral inferiority.

Under 'Social Conditions and Tendencies' it is shown that the blacks take kindly to religious institutions, though education pervades their ranks more slowly, and that neither counteracts criminal tendencies so completely as has been hoped; it is also shown from ample statistics that crime is nearly thrice as prevalent among the blacks as among the whites, this relation holding even when the negro is compared with the most criminal nationalities. The statistics for different cities and sections appear to indicate also that crime is increasing among the blacks, though decreasing among the whites. A considerable body of data relating to lynching has been brought together, which seems to indicate that neither this summary mode of punishment nor the crimes for which it is the penalty are decreasing. Efforts are made also to tabulate the statistics of pauperism, and the tables indicate the great preponderance of pauperism among the blacks, though it is evident that the figures do charitable justice to this phase of the character of the alien race. Under 'Economic Conditions and Tendencies' the negro is considered as an agricultural laborer and as an industrial factor, and it is shown that he profits little, and, according to many opinions, suffers from education, and displays a lamentable lack of thrift and public spirit as a citizen, though filling fairly well a subordinate position in industrial society.

In the final chapter (a 'Conclusion' in name and in the fact that it ends the book, though not at all as a summary of the investigation) comparisons are instituted between the American negro and various other races, including the American Indians, the Maoris, etc.; the author not only concurring in, but adding weight to, the general opinion concerning the decadence of the lower races when brought in contact with the higher.

From a sociologic point of view, if not from that of the statician or economist concerned with great masses rather than inconspicuous (albeit important) principles, a criticism may be lodged against the book; and it may be stated the more starkly, *first*, because all or nearly all current statistical discussions of the subject are open to the same criticism, and *second*, because another Federal census is in contemplation, and it would seem especially timely to direct atten-

tion toward a little-considered factor in the negro problem. The author justly points out that during the days of slavery the amalgamation between the whites and blacks was illicit, and that the mulattoes and other mixed bloods were almost exclusively the progeny of white fathers and black or mixed-blood mothers, and his discussion of the vital and other characteristics of the American negro is based on these conspicuous facts; and he justly observes that, with the abolition of slavery, illicit amalgamation decreased enormously, and, so far as fruitful unions are concerned, has practically disappeared. He also gives slight recognition to the fact that amalgamation is proceeding slowly through intermarriage; yet he does not notice (although his statistics clearly indicate as much) that by far the greater part of the legitimate and productive unions are between black men and white women, rather than between white men and black women, as during slavery. Thus in Michigan, during the 20 years 1874–1893, 111 out of the 14,151 marriages were interracial, and of these 93 were between black or mulatto males and white females, leaving only 18 unions of the slavery type (page 198); and in Rhode Island, during the 13 years 1881–1893, there were 51 white females and only 7 white males in the 58 interracial marriages (page 199). So too, in the 23 cases of interracial marriage (excluding the sporadic unions) studied by the author, there were 19 white women to 4 white men (page 204). These ratios are in accordance with the casual observations of the reviewer, who has noted in addition (again leaving out of account sporadic and irregular unions) that many of the blacks who marry white women are among the leading representatives of their race, one being the most illustrious in American history, while in some cases at least the white wives are fairly representative of their race and sex. Now a question at once arises concerning the characteristics of the progeny of such unions, who may not be numerous but who represent a distinct class of our population; a question arises also as to whether these legitimate interracial unions are increasing, as the meager figures appear to indicate; and there are half a dozen collateral inquiries which will occur to sociologists, and perhaps to those statisticians who, like the author of the memoir under notice, are given to considering the meanings expressed by figures as well as the figures themselves. This criticism, it will be observed, is of the constructive rather than the destructive sort; it does not tend to invalidate any of the results of Mr. Hoffman's excellent work, but, if well founded, indicates a direction in which the work might have been carried further advantageously.

W J McGee.

Les Aryens au Nord et au Sud de l'Hindou-Kouch. Par Charles de Ujfalvy. pp. 488. G. Masson, Paris. 1896.

M. Ujfalvy is known as a diligent student of anthropology and an earnest disciple of Broca. He has the same implicit faith in the permanence of the physical type and its superiority over all other human traits for the purposes of classification and tracing descent. The feature beyond others, which he considers ranks in significance, is the cranial index. A nation, he observes, may lose its language, alter its social condition and deeply modify its blood by crossings; but it will always preserve the traces of its primitive physical type. Only through a long process of transformation, by which the encephalon is materially altered in its lines of growth, and thus changes the shape of its bony envelope, can a brachycephalic people, for instance, become dolichocephalic.

These are the leading principles of investigation which the author proceeds to apply to the Aryan tribes of Central Asia. The main topic is preceded by two introductions, the first geographic and historic, the second 'ethnologic, ethnogenic and biologic.' The former not only describes the geographic features of the region and its trade routes, but lays especial stress on the great *loess* formations and their bearings on human character and distribution. The primitive Aryan Iranians, he argues, were immediate neighbors to the ancestors of the Chinese.

The second introduction is largely historical. The author points out the wide variance in the skull-types of the modern Asian Aryans and seeks to explain it by various invasions and interminglings in ancient times, and biologic laws—ever faithful to his motto: "Il existe

dans chaque race un type crânien qu 'il s'agit de retrouver.''

The remainder of the work is divided into three parts. The first is devoted to the Aryans north of the Hindu Kusch range. These include the Galtchas, the Tadjiks of the mountains and the plains, the Iranians of the Pamir, and various lesser conglomerations, as the Kashgars, the Darvasis and the Karatheghins. Each of these is conscientiously studied, not merely from the physical side, but including their dialects, religions, governments, history and civilization. Free use is made of other writers, and it must not be forgotten that the author has extensive sources of personal observation, his wide travels in Central Asia having provided him with abundant material.

The second part takes up the tribes of Dardistan, Baltistan and Kafiristan, with similar thoroughness. Especial attention is paid to their religions and castes, the influence of Mazdeism and Buddhism, their sociologic customs and the differences between the Aryan dialects north and south of the Hindu Kusch. Incidentally, many other questions of anthropology are mentioned. For instance, he assigns to the Dravidas of India a 'half-mongolic' origin (page 240), which thus explains their agglutinative languages. (This overlooks the quite different system of their agglutination.) In this part much use is made of the observations of Leitner and Risley, and the researches of Ratzel and Biddulph.

The third part is an epitome of his conclusions. A careful statement is presented of the physical traits, especially those of the crania. His inference is positive that the *Homo Europæus* never had his birthplace in Central Asia, as his corporeal type is nowhere found there. The Hindoo, of Hindustan, may be a homologue of the Mediterranean type.

A first appendix follows on the early Bactrian and Scythic coinage, of great interest to the historian and numismatist, and a second on the anthropologic terminology adopted by the author. A moderately well drawn and not very clear ethnographic map is appended.

The work deserves high recommendation. It is learned and fair, rich in information not easily accessible. Some will find it in a too exclusive adherence to physical standards of ethnic comparison; but that is the author's avowed position.

D. G. BRINTON.

SCIENTIFIC JOURNALS.

THE MONIST.

THE bulk of the contents of the January *Monist* is occupied by three long and exhaustive articles: (1) 'The Logic of Relatives,' by C. S. Peirce; (2) 'Animal Societies,' by Paul Topinard; (3) 'The Philosophy of Buddhism,' by Paul Carus.

Mr. Peirce's article is his first publication on the subject of the logic of relatives since 1884, and while devoting much space to a critical analysis of parts of Schröder's new volume is still comprehensive enough to embrace an independent exposition of the theory of graphs, of dyadic relatives, and offers for the first time Mr. Peirce's rules for working with the 'General Algebra of Logic.' New diagrams and improvements of characters are introduced, and finally certain important mathematical developments in the combinatorial analysis are given.

Dr. Topinard examines at considerable length the causes and forms of the various social assemblages met with in the animal world, and his conclusions touch the important questions of the function of the various instincts, the rôle of the family, etc., in the formation of animal society, as well as directly develop a distinction between 'colonies' and societies, profoundly affecting that doctrine which bases sociology on biology.

Finally, in *The Philosophy of Buddhism*, Dr. P. Carus seeks to reveal the scientific kernel of ancient Buddhistic thought, compares its results to the doctrines of modern psychology, animadverts upon Oldenberg's philosophical interpretation of Buddha's doctrines, and closes with a psychological elucidation of the doctrine of Nirvâna.

Prof. J. M. Tyler discusses Cope's *Primary Factors of Organic Evolution;* the usual French correspondence, and reviews of Ostwald's scientific classics and of works by Cantor, Griesbach, Freycinet, etc., appear; while in Discussions we have remarks upon *Panlogism*, by E. Douglas Fawcett, and a mention of the proposed new scientific catalogue.

SOCIETIES AND ACADEMIES.

NEW YORK ACADEMY OF SCIENCES.—SECTION OF ASTRONOMY AND PHYSICS, DECEMBER 7, 1896.

Prof. J. K. Rees gave a very interesting review of the work of Newton, Evans and others upon the probable orbit and period of the great shower of meteors which were seen in 1833 and 1866, and which are soon due again. Attention was also called to the work of Leverrier, and Opholtzer in finally settling the period of this swarm at about 33¼ years. At the request of Prof. Stone observations were made at all the large observatories, on the night in November, to see if by chance an unusual number of meteors should be observed, thus indicating that the swarm had so scattered out that some of the advanced guard would appear even three years ahead of the general mass. The number observed by Prof. Rees was no greater than normal and the results were rather negative.

H. C. Parker, upon a universal method of measuring current, showed how it is possible and convenient to measure currents varying from a fraction of a microampere to a megalampere, *i. e.*, from, say a hundred millionth, to a million amperes, simply using a voltmeter, or a delicate galvanometer, in connection with a series of shunts. He exhibited a series of such shunts ranging from 0.1 ohm to 0.00005 ohm which had been determined with the double bridge with an error not to exceed 0.1%.

W. Hallock then exhibited some mechanical devices by means of which it is possible to illustrate the interference of two beams of light with any desired phase difference, and another showing how a beam of plane polarized light is resolved into two beams at right angles to each other on entering a double-refracting medium.

Dr. T. A. Humason reported upon the meteors seen on December 4th, as follows: While riding in Central Park opposite West Seventy-second Street, at twenty minutes to five, on the afternoon of December 4th, I saw a meteor so brilliant as to be plainly visible, though it was then about sunset and quite light. The meteor caught my attention at an altitude of fifty degrees, a little south of east, and descended almost vertically and with rapid motion, until it reached an altitude of fifteen degrees, when it disappeared. The head had a diameter of about fifteen minutes and was very clearly defined. A train, two or three degrees in length, was also visible. The eastern sky was almost covered with clouds and the meteor seemed to be between them and myself, though it is probable that it was above the clouds and was seen through them. The meteor vanished in mid-air, without passing behind any intervening object, and as meteors are usually extinguished within five or ten miles of the earth it seems probable that this was near the end of its journey and not far above the city.

At the same time people on Brooklyn bridge observed a meteor in the northeastern sky. It is possible that these were one and the same; and if so, owing to the difference of direction from the two points of observation, the meteor must have been very near. But it is quite possible that the observers on Brooklyn bridge were looking at a different meteor, for another was seen at the same time from Fordham, and directly east of that place, which would have been visible in the northeastern sky from Brooklyn bridge.

At the time these meteors were seen, another was observed passing over Passaic, N. J., and moving eastward; another over Irvington-on-the-Hudson, moving northeastward, and one over Danbury, Conn., also traveling in a northeasterly direction. It is evident that this was not a single meteor seen from these several places, but that there were several meteors traveling in slightly different directions. As large meteors seldom or never travel in groups and as they are usually shattered near the end of their course, it is probable that this came into the atmosphere a single, large meteor and that it burst not far from here, the fragments taking slightly different directions. All of these observations would be satisfied by the following hypothesis: Passaic, Irvington and Danbury are almost in a straight line. It is probable that the meteor approached this neighborhood, passing over Passaic and moving eastward; that immediately after passing Passaic it separated into three or more parts, one turning slightly to the north and passing over Irvington and Danbury, another continuing in a straight line and passing over Fordham, and a third turning

slightly south and passing over New York. Another report states that a meteor was also seen over Rahway, N. J., which burst and came to the ground in four parts. This was probably another offshoot from the same original, and must have left it, if this hypothesis is correct, before it reached Passaic.

W. HALLOCK,
Secretary of Section.

SECTION OF BIOLOGY, DECEMBER 14, 1896.

PROF. J. G. CURTIS, Chairman, in the chair.

Dr. Arnold Graf made a preliminary report on 'Some New Fixing Fluids.'

Mr. J. H. McGregor read a paper entitled 'An Embryo of *Cryptobranchus*.' The embryo described is about 16 millimetres long, and is the first to be recorded of this species. Prominent among its external features are the excessive amount of yolk, the marked ventral flexure in the cervical region and the very early and almost simultaneous appearance of the two pairs of limbs. The dorsal surface is pigmented, the pigment cells being arranged in transverse bands, one band over each metamere of the body. Lateral line sense-organs can be distinguished. Among the most striking internal characters may be mentioned the dorso-ventral flattening of the notochord, the late appearance of entoderm and alimentary organs generally, due doubtless to the great mass of the yolk. The primordial skull is unusually well developed. The auditory vesicle has an endolymphatic duct ending blindly immediately under the skin on the top of the head. Along the sides of the body a system of organs occurs which are probably homologous with the embryonic sense-organs described by Beard in the sharks.

Dr. J. L. Wortman spoke of the *Ganodonta*, a new and primative suborder of the Edentata from the Eocene of North America. One section or family of the suborder, viz: the *Stylinodontidæ*, is composed of *Hemiganus*, *Psittacotherium*, *Ectoganus* and *Stylinodon*, and forms a closely connected and consecutive phylum, reaching from the base of the Puerco to the Bridger formation and leading directly to the Gravigrada or ground sloths. A second family, viz: the *Conoryctidæ*, composed of *Conoryctes* and *Onychodectes*, may be regarded as ancestral to the Armadillos. The character and origin of the Edentate fauna of South America was discussed at length and the conclusion reached that its original home was in North America. It was further held that there was a migration to the southward before the close of the Eocene and that there must have then been an early land connection between the two continents.

C. L. BRISTOL,
Secretary.

THE AMERICAN CHEMICAL SOCIETY.

THE regular meeting of the New York Section of the American Chemical Society was held, by invitation of Drs. Morton and Leeds, at the Stevens Institute of Technology, Hoboken, on the 11th inst.

An unusually large representation from the Society's membership gave attention to the proceedings.

Dr. Leeds described the development of methods for the quantitative estimation of micro-organisms in waters with especial reference to the study and control of discolorations and offensive odors in water supplies, such as afflicted the city of Brooklyn in the summer just passed; a matter entirely distinct from the bacteriology of water in a pathogenic sense, and, therefore, in nowise at issue with work of that character.

Dr. Leeds recommended that engineers in charge of water supplies should familiarize themselves with the simple apparatus and manipulation necessary to enable them to foresee the approach of conditions favorable to the growth of these micro-organisms productive of color and odor, and thus be enabled to take such steps as may be applicable to the hindrance or prevention of their development.

After the reading of Dr. Leeds' paper the Society was invited to adjourn to Dr. Morton's lecture room, where all preparations were complete for the very interesting and beautiful experiments which followed.

The causes of the phenomena of fluorescence were explained, and many illustrations given by the aid of solutions, colored screens and monochromatic light. Particularly striking were the effects produced by the substance

'Thallene,' isolated from petroleum residues some years ago by Dr. Morton.

Another adjournment to Dr. Morton's house, where the meeting was brought to a close with an informal reception.

The members present were united in their appreciation of Dr. Morton's hospitality, and the meeting must be recorded as one of the most enjoyable held by the New York Section.

DURAND WOODMAN,
Secretary.

BOSTON SOCIETY OF NATURAL HISTORY.

A GENERAL meeting was held Wednesday, December 2d, forty-eight persons present. The evening was devoted to a commemoration of the life and services of Thomas Tracy Bouvé, who had died on June 3, 1896.

Dr. James C. White read a letter from Mr. Charles J. Sprague, recalling some of the prominent characteristics of Mr. Bouvé as a man, and of his business abilities and scientific attainments. Dr. White then read an appreciative review of Mr. Bouvé's long and important services to the Society and to science. Prof. Alpheus Hyatt spoke of Mr. Bouvé's work in the Society since 1870, and Prof. W. O. Crosby gave an account of Mr. Bouvé's contributions to scientific literature, and of his work in connection with the Society's collections of minerals, rocks and fossils.

A letter from Prof. James Hall, reminiscent of the early days of the Society and of the services rendered to science by Mr. Bouvé and several of his associates, was read; also letters from Profs. Goodale and Putnam.

SAMUEL HENSHAW,
Secretary.

THE ALABAMA INDUSTRIAL AND SCIENTIFIC SOCIETY.

THE regular winter meeting of the Society was held in the city of Birmingham on Tuesday, December 15, 1896. Mr. Fred. M. Jackson, President of the Society, was in the chair, and ten members were present. A committee appointed at the last meeting to arrange for the collection, monthly, of statistics of the iron ores, coal, coke, limestone and other mineral resources and products of the State, reported by recommending a plan by which the collection of these statistics would be undertaken by Mr. W. M. Brewer, under the auspices of the Society and of the State Geological Survey. The plan recommended by the committee was adopted, and it is the intention to prepare monthly tables of statistics, to be furnished to such of the technical journals as may wish to publish them, and to be kept on file in the offices of the Secretary of the Society and of the State Geologist.

Two papers were presented, viz.: On Gold Milling in Clay County, Alabama, in the Idaho district, by Joshua Franklin, and on the Manganese Deposits of Georgia, by Wm. M. Brewer.

Mr Franklin gave the details of his recent experience in treating with profit the low-grade gold ores of Clay County with a Huntington mill, shaking coppers, blanket sluices and amalgam traps. The paper of Mr. Brewer was read by title only, being delayed in the mail.

After the reading of the papers there followed an instructive discussion of the subject of coke-making, Dr. Phillips, Mr. Jackson, Mr. Erskine Ramsay, Col. A. J. Montgomery and others taking part therein. The great importance of the recovery of the by-products of the coking ovens was particularly dwelt upon. This subject has often been discussed at previous meetings, and a number of experiments have been made at several points near Birmingham with a view to utilizing some, at least, of these now generally wasted products.

The next meeting, at which the officers for the ensuing year will be elected, will be held some time about the beginning of the summer months.

EUGENE A. SMITH,
Secretary.

NEW BOOKS.

Habit and Instinct. C. LLOYD MORGAN. Edwin Arnold, London and New York. 1896. Pp. 351.

Outlines of Psychology. WILHELM WUNDT. Translated by Charles Hubbard Judd. Leipzig, Wilhelm Engelmann. Pp. xviii+342.

Outlines of Electricity and Magnetism. CHARLES A. PERKINS. New York, Henry Holt & Co. 1896. Pp. viii+272.

Star Atlas. WINSLOW UPTON. Boston and London, Ginn & Co. 1896. Pp. iv+29 and plates.